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Hot Food Takeaways around schools: Can fast food be healthier?

Turbutt, Claire Louise

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UNIVERSITY OF PLYMOUTH

HOT FOOD TAKEAWAYS AROUND SCHOOLS: CAN FAST FOOD BE HEALTHIER?

by

CLAIRE LOUISE TURBUTT

A thesis submitted to University of Plymouth in partial fulfilment for the degree of

MASTERS BY RESEARCH

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Hot Food Takeaways around schools: Can fast food be healthier?

Abstract

Obesity is the greatest global health challenge facing this generation; over half of the adult population are overweight or obese. Calls for food environment interventions include recommendations for restriction or banning of new fast food retailers (FFRs). The Takeaway Toolkit was published by the Chartered Institute of Environmental Health and aimed to alter consumption of unhealthy takeaway food through reformulation and behavioural insights.

A systematic review assessing evidence on FFRs in the environment around schools in the United Kingdom (UK) was completed and published. This revealed a research gap around food environment interventions. A study was designed to investigate *“the impact of an intervention based on the Takeaway Toolkit on a fast food retailer”*. A pragmatic theoretical framework identified the mixed methods research approach used. A survey with Year 6 pupils identified FFRs they frequented. The most popular sole trading FFR was recruited; customer and nutritional data were collected before and after the application of an intervention. A semi-structured interview was completed with the FFR.

Results showed the intervention was successful in reducing calories, fat, salt and sugar content of food sold; the changes had no impact on the sales of food within the premises and therefore indicate an FFR can make changes to the nutritional

content of food they sell without undermining their business. Customer experience/preference and profitability were principal influences on whether the FFR made or maintained nutritional improvements. Additionally in the period immediately post-school (3.15pm – 3.45pm) the majority of FFR customers were school pupils.

This study identifies the influences on change within FFRs and indicates implementing recommendations within the Takeaway Toolkit may indeed have an impact on the nutritional content of food sold within FFRs.

Further research is recommended to confirm these findings, along with extensions to the study investigating customer experience and the impact on wider range of FFRs.

List of contents

Copyright statement	1
Title Page	2
Abstract	3
List of illustrations and tables	10
Acknowledgements	13
Chapter 1 : Introduction	18
Aims and Objectives.....	28
Chapter 2 Systematic Review	30
Eligibility criteria	30
Search strategies.....	32
Study identification.....	33
Systematic Review Results.....	34
Included studies.....	34
Review findings - Study focus.....	38
Main findings from the evidence contained in the included papers.....	45
Systematic review discussion	49
Chapter 3 : Methodology and Methods	55
The Takeaway Toolkit	56
Choosing the intervention for the study	57
Philosophical position.....	58

Consideration of appropriate theoretical frameworks	58
Research approach	62
Research methods	64
Designs used in previous studies	65
Experience of customers	66
Nutritional Content of Food	67
Experience of fast food retailer	68
Research strategy and design.....	73
The research process.....	73
Stage One - Identification of the fast food retailer	73
Study stage two	76
Data collection	79
Data collection tools.....	80
Data analysis.....	89
Quantitative data.....	89
Qualitative data analysis	91
Ethics	93
Ethical approval.....	93
Informed consent (pupils)	93
Informed consent (fast food retailer)	94

Openness and honesty	94
Right to withdraw	94
Protection from harm (school pupils)	95
Protection from harm (fast food retailer)	95
Confidentiality and anonymity	95
Reliability and validity	96
Chapter 4 : Results	97
1. Health related behaviour survey (HRBS) and study questionnaire.....	98
Demographics.....	98
2. Food served in fast food restaurants	102
Fast Food Meal Deal Sample	107
3. Footfall Survey	112
4. Fast food retailer interview	118
Interview themes.....	118
Chapter 5 : Discussion	124
1. The study online survey with pupils	125
2, 3, 4 The main findings relating to the fast food retailer	126
2. The footfall survey	126
3 and 4. The food sample and interview with fast food retailer	128
Changes at the individual level	129

Changes at the intrapersonal level	131
Changes at the organisational level	134
Changes at the community level	139
Changes at the systemic level	140
Recommendations for further study	141
Competition	141
Customer Perspective	142
Customer taste preference	142
Portion Size	143
What do we now understand as a result of this study?	146
Strengths of the study	149
Variety of data collected	149
Length of time over which data collected	150
Recruitment of a FFR was successful	150
Limitations of the study	150
Small size of study	150
Survey	151
Fieldwork	151
Conclusions	152
Chapter 6 Appendices	163

Appendix 1 School Questionnaire	163
Appendix 2 Ethical Approval letter.....	171
Appendix 3 Footfall survey blank record form	174
Appendix 4 Aggregated data, tables and figures from 15 question survey with pupils.....	175
Food behaviour	175
Appendix 5 Suppressed raw data.....	184
Chapter 7 Publications.....	Error! Bookmark not defined.

List of illustrations and tables

FIGURE 1.1 <i>THE DETERMINANTS OF HEALTH AND WELLBEING IN OUR NEIGHBOURHOODS, DAHLGREN AND WHITEHEAD AS ADAPTED BY HUGH BARTON 1990</i>	20
FIGURE 1.2 <i>FORESIGHT OBESITY SYSTEM MAP (9)</i>	22
FIGURE 2.1 <i>SYSTEMATIC REVIEW FLOWCHART</i>	34
FIGURE 3.1 <i>FLOW CHART SHOWING THE STUDY ACTIVITIES</i>	73
FIGURE 4.1 <i>COLUMN GRAPH SHOWING TOTAL NUMBER OF VISITS TO THE STUDY FAST FOOD TAKEAWAY DURING BOTH SURVEY PERIODS</i>	113
FIGURE 4.2 <i>TOTAL NUMBERS OF PEOPLE ENTERING FAST FOOD RETAILER DURING SURVEY PERIODS 23RD – 29TH JUNE 2017 AND FEBRUARY 15TH – 22ND 2018</i>	115
FIGURE 4.3 <i>SHOWING PEAK TIMES FOR EACH CATEGORY OF CUSTOMER IN THE FAST FOOD TAKEAWAY DURING SURVEY PERIOD 1</i>	116
FIGURE 4.4 <i>SHOWING PEAK TIMES FOR EACH CATEGORY OF CUSTOMER IN THE FAST FOOD TAKEAWAY DURING SURVEY PEAK PERIOD 2</i>	117
FIGURE 5.1 <i>ECOLOGICAL DIAGRAM SHOWING THE RESULTS OF THE STUDY ...</i>	129
FIGURE 6.1 <i>COLUMN GRAPH SHOWING PUPILS SELF-REPORTED CONSUMPTION OF FOODS CONTAINING FREE SUGARS (N=24)</i>	1798
TABLE 2.1 <i>INCLUSION AND EXCLUSION CRITERIA FOR THE SYSTEMATIC REVIEW</i>	30
TABLE 2.2 <i>SYSTEMATIC REVIEW SEARCH TERMS</i>	32

TABLE 2.3 <i>QUALITY ASSESSMENT OF PAPERS INCLUDED IN THE SYSTEMATIC REVIEW</i>	35
TABLE 2.4 <i>INCLUDED PAPERS ORGANISED BY THEME, SHOWING FOCUS, HOT FOOD TAKEAWAY DEFINITION AND VARIABLES MEASURED</i>	39
TABLE 3.1 <i>DATA PROVIDED BY SURVEY QUESTIONS COMPLETED BY THE SCHOOL CHILDREN.</i>	83
TABLE 3.2 <i>SHOWING THE CATEGORIES USED TO RECORD FOOTFALL AT THE STUDY PREMISES</i>	86
TABLE 3.3 <i>SHOWING THE PARAMETERS TESTED WITHIN THE FOOD SAMPLE</i>	88
TABLE 4.1 <i>SHOWS THE COMPARISON BETWEEN CHARACTERISTICS OF THE STUDY GROUP AND THOSE FOR THE CITY</i>	98
TABLE 4.2 <i>PUPIL'S RESPONSE TO THE QUESTIONS "WHICH OF THE FOLLOWING FOOD PREMISES HAVE YOU BOUGHT FOOD FROM IN THE PAST FOUR WEEKS?"</i>	99
TABLE 4.3 <i>SHOWING MENU IN STUDY RESTAURANT</i>	101
TABLE 4.4 <i>SHOWING FOOD PREPARATION METHODS WITHIN THE STUDY PREMISES</i>	102
TABLE 4.5 <i>SHOWING THE CHANGES MADE IN THE FAST FOOD RESTAURANT FOLLOWING THE INTERVENTION.</i>	105
TABLE 4.6 <i>LABORATORY RESULTS FOR FOOD SAMPLE 1</i>	109
TABLE 4.7 <i>LABORATORY RESULTS FOR FOOD SAMPLE 2</i>	110
TABLE 4.8 <i>SHOWING COMPARISON BETWEEN THE TWO SAMPLES</i>	111
TABLE 4.9 <i>SHOWING THEMES WITHIN QUALITATIVE INTERVIEW WITH FAST FOOD RETAILER</i>	118

TABLE 6.1 <i>FOOTFALL SURVEY BLANK RECORD FORM</i>	174
TABLE 6.2 <i>AGGREGATED DATA FROM SURVEY FOR RESPONSE TO BREAKFAST QUESTION (N=24)</i>	175
TABLE 6.3 <i>AGGREGATED DATA FOR RESPONSE TO 5-A-DAY QUESTION (N=24)</i>	176
TABLE 6.4 <i>AGGREGATED DATA FOR RESPONSE TO QUESTION ABOUT LUNCH (N=24)</i>	177
TABLE 6.5 <i>AGGREGATED DATA FOR RESPONSE TO QUESTION ON WATER CONSUMPTION (N=24)</i>	178
TABLE 6.6 <i>PUPIL'S RESPONSE TO THE QUESTION "HOW FIT DO YOU THINK YOU ARE?" (N=24)</i>	180
TABLE 6.7 <i>PUPIL'S RESPONSE TO THE QUESTION "HOW MANY TIMES LAST WEEK DID YOU EXERCISE ENOUGH TO MAKE YOU BREATHE HARDER AND FASTER?"</i>	181
TABLE 6.8 <i>PUPIL'S RESPONSE TO THE QUESTION "HOW MUCH DO YOU ENJOY PHYSICAL ACTIVITY?"</i>	182
TABLE 6.9 <i>PUPIL'S RESPONSE TO THE QUESTION "HOW DID YOU TRAVEL TO SCHOOL TODAY?"</i>	182
TABLE 6.10 <i>SUPPRESSED RAW DATA</i>	184

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The desire to undertake this study was prompted by the author's experiences as a public health professional of development planning, specifically her involvement in the work to introduce a new local planning policy to Plymouth which would restrict the development of new fast food premises around secondary schools in the city. Through this work she was exposed to an interesting area of public health application and became interested in pursuing research related to fast food and childhood obesity.

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AUTHOR'S DECLARATION

At no time during the registration for the degree of Masters by Research has the author been registered for any other University award without prior agreement of the Doctoral College Quality Sub-Committee.

Work submitted for this research degree at the University of Plymouth has not formed part of any other degree either at the University of Plymouth or at another establishment.

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External Contacts: Behaviour and Health Research Unit, Cambridge University, contact with Williams from the paper Williams et al.

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Signed.....

Dated.....

Chapter 1 : Introduction

It's 3:10pm on a rainy day; the fluorescent light pouring from the chip shop at the end of the road is accompanied by the smell of frying food, vinegar and salt. As the local school opens its gates, which have been sealed since 8.45am this morning, a small tide of uniformed children make their way through the drizzle and along the road, heading home; for many though, their first stop is at the counter to purchase their cheesy chips, which they will finish before they get home.

This scene plays out every evening in many streets across the United Kingdom (UK). The proliferation of fast food restaurants around schools over the past twenty years has increased noticeably and consumption of fast food appears to have kept pace with it (1, 2), the out of home food industry was estimated in 2012 to have a £73billion turnover (3). The University of Cambridge Food Environment Assessment Tool (FEAT) (4) has recorded a staggering increase in the number of fast food takeaways since 2014, from 88 per 100,000 population to 96.5 per 100,000 population in 2017 the UK. There are 14% more fast food restaurants recorded in Plymouth (4) since 2014. The link between fast food takeaways provision and obesity is hotly contested and the interaction of the food environment with individual choices is a rapidly expanding area of research. This thesis aims to contribute new evidence to this lively area of research.

Obesity is the greatest global health challenges of the twenty first century. In the UK by the end of primary school we know from the National Child Measurement Programme that over a third of children will be overweight (5) and by the end of secondary school this will be closer to 40% (5). Obesity is linked with multiple chronic diseases including diabetes, heart disease, stroke, cancer and respiratory disease (6). Dahlgren and Whitehead created a diagram which illustrates the determinants of health which influence health outcomes. It was adapted by Barton and Grant in 1990 to emphasise the impact of the environment on health and it is shown below in Figure 1.1

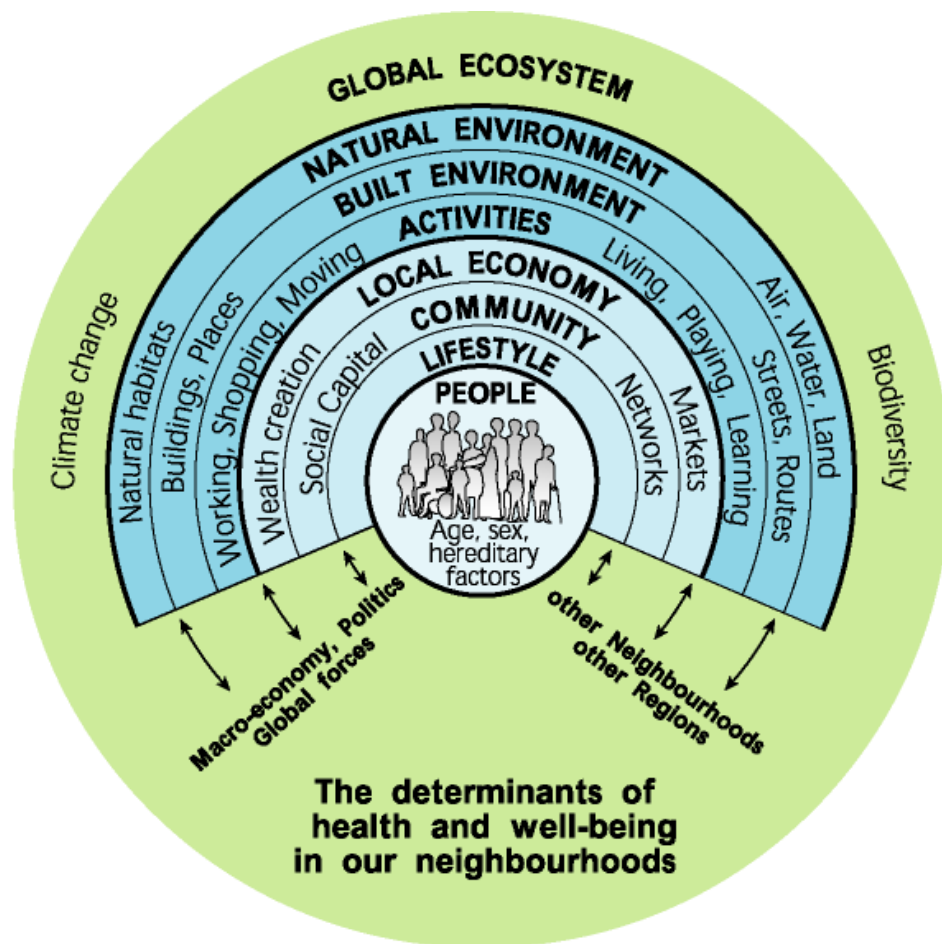


Figure 1.1 *The determinants of health and wellbeing in our neighbourhoods*,
Dahlgren and Whitehead as adapted by Hugh Barton 1990

Evidence that ‘unhealthy’ eating interacts with other levers to cause obesity is strong (1-3, 7-9). Swinburn was probably the first academic to identify and define the ‘obesogenic environment’ in the late 1990’s (10) saying in his work on the PIMA Native Americans that ‘*obesity was just a normal physiological response to an abnormal environment*’. This work led to the development of an ecological approach to obesity research which took into account the physical circumstances

which can interact with social and biological factors to result in obesity (11). In the intervening 20 years many research studies have focused on quantifying individual elements in the environment in which people live which impact on their weight status (12-28).

The Foresight review (9) published in 2008 gathered together all the existing evidence relating to obesity within the UK at that time. The review strongly influenced how obesity has been tackled in the UK and it contained a diagram (see Figure 1.2) which illustrates the complexity of the interactions between humans and food in order to determine obesity. The diagram draws together thematically the different levers which affect consumption of food and amount of physical activity undertaken (these are shown in the centre of the diagram as the two main influences on obesity status). There are seven themes within the diagram, and the authors made an attempt to symbolise the strength of each lever's influence. The environment in which people live was one of these themes.

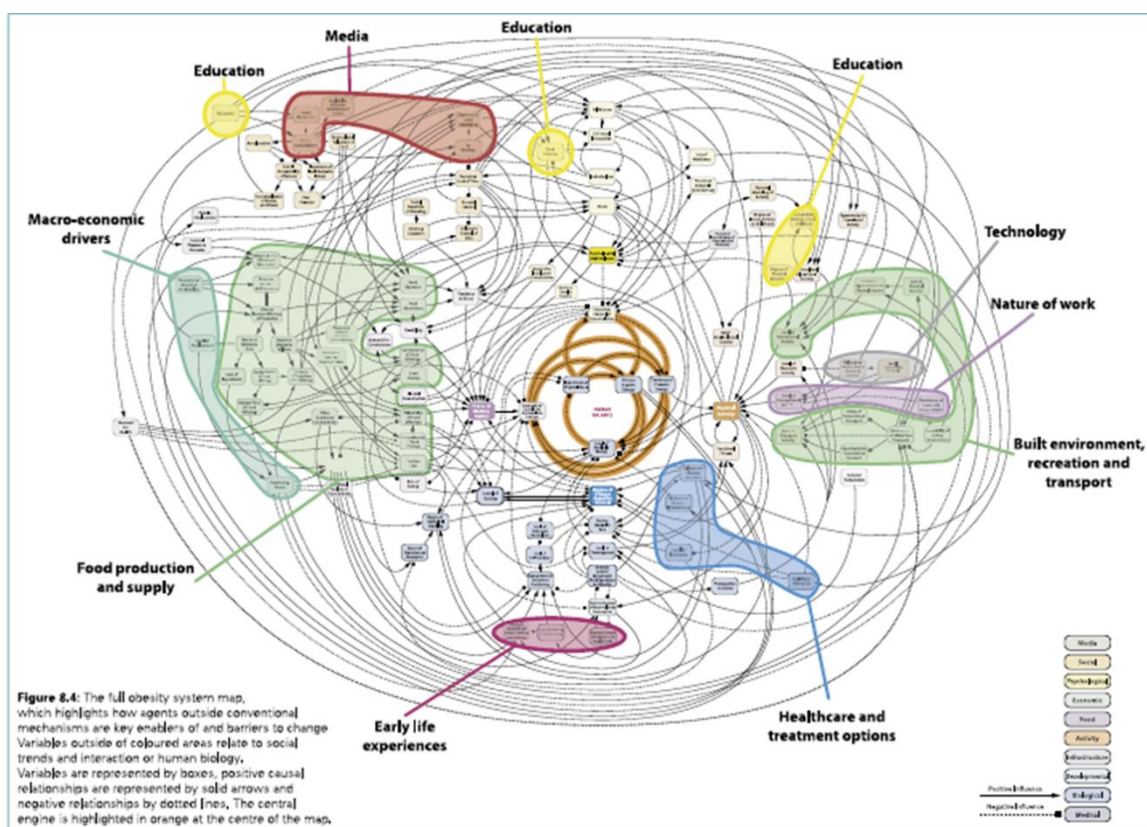


Figure 1.2 *Foresight Obesity System Map* (9)

Within the diagram, the availability of fast food is identified as a risk factor.

The evidence base for showing a link between the consumption of high fat, sugar, salt foods (HFSS) and obesity has become stronger over recent years (1-3, 7, 9, 24, 29-32) although there are comparatively few studies specifically focused on HFSS and obesity, however a systematic review which will be described later looks at the quality of this evidence in detail. The application of this new evidence has led to a number of interventions designed to influence the consumption of salt, sugar or fat within the obesogenic environment; it is believed this could have an impact on childhood obesity, allowing children born today to live longer, healthier, and happier lives (9).

As mentioned above numbers of hot food takeaways in the UK have been steadily increasing and there is strong evidence that they cluster in the most deprived neighbourhoods of cities (28, 33). Research by the Cities Institute in London has identified a fast food takeaway can be set up for £15-20,000. Many takeaways are therefore sole traders who own only one business (34). However, the evidence that eating more fast food than another person leads to obesity has been more difficult to find, and few research studies have focused solely on this issue (28).

Within the last twenty years evidence has shown there are more fast food restaurants, and fewer shops selling fresh vegetables (35-37) in deprived areas. Schools in deprived areas are less likely to have green spaces for pupils to access (1).

Hot food takeaways, a sub group of fast food outlets, are defined under planning guidance as A5: premises providing hot food to the public without making any seating available to customers to eat their meals inside (38). They *can* serve any form of hot food but most frequently they serve deep fried, protein and carbohydrate based foods in large portions with minimal fibre or vitamins and minerals (2). Fast food outlets have also been shown to serve foods which are high in salt, sugar and saturated fat (HFSS foods), the increased consumption of which is associated with an increased risk of obesity and co-morbidities of CVD, diabetes, and osteoarthritis (3, 34, 39).

As can be understood from the paragraphs above, the increase in the availability of fast food within the food environment appears to be linked to an increase in obesity. Few research paper's quantifying this link have as yet been published and the evidence of a link and whether it is causal or a simple correlation is still discussed. In the meantime fast food retail units are becoming more pervasive within urban and rural areas and specifically within deprived wards within urban areas (37, 40-43). Obesity rates continue to increase and chronic disease is estimated to account for over half of all deaths nationally. It is therefore necessary to look for a solution.

The proposed solutions

Overseeing the health of the population is the government organisation Public Health England; they have a responsibility to optimise the health of the nation. They do this through influencing and guiding population level health work in England. In 2014 they published "*Obesity and the environment briefing: regulating the growth of fast food outlets*" a document which calls for controls on the numbers of fast food outlets developed in areas where children congregate (3).

The National Institute for Clinical Health Excellence (NICE) published guidance (7) on reducing and preventing obesity which also called for local authorities to take steps to reduce the amount of fast food restaurants within the environment in which children spend time (schools, leisure centres, parks). They suggested the use of development planning legislation to achieve this aim. Within the public health

community encouraging the development planning community to introduce new policies in this area has been ongoing for several years. The author of this thesis has had several conversations with planning officers relating to whether or not children were purchasing fast food unsupervised. The belief that primary school children had no opportunities to obtain fast food without their parents' permission was held by several planning officers engaged in determining whether or not the policy relating to the restriction of fast food premises near schools was implemented. This thesis can trace its genesis to these conversations alongside the removal of primary schools from the policy within Plymouth.

Prior to the publication of the above PHE and NICE documents one potential solution to the proliferation of fast food outlets which had been popular was the idea of training outlet owners to 'make their food healthier'. The Chartered Institute of Environmental Health (CIEH), the professional body for those professionals who inspect food premises for compliance with hygiene legislation, developed a "takeaway toolkit" with the Local Government Association of London which was published in 2011 (39). This toolkit makes three recommendations, the first of which encouraged local council EHPs to promote behaviour change amongst hot food takeaway owners in order to reduce the impact of fast food on the health of their customers. This toolkit was referred to by NICE and PHE in their guidance advising of appropriate actions to be taken to control and prevent obesity in the UK (1, 2, 7)

One section in the takeaway toolkit puts forward a list of healthier options for hot food takeaway owners, which when applied, improves the nutritional content of

their food (reducing salt, sugar and sat fat). A case study from Magherafelt District Council in Northern Ireland found a positive impact on the nutrition of food following the implementation of the toolkit guidance in twenty-seven takeaways used by school children in their district (39).

In 2012 the Food Standards Agency funded a small pilot project with an independent sandwich producer in Plymouth aiming to improve the healthiness of their food offer. The project which was repeated nationally was shown to increase profits through reducing the amount of mayonnaise and margarine used for filling sandwiches, whilst having no impact on customer satisfaction with the sandwiches (44). It was expected that interventions which improved the nutritional content of out of home foods whilst having a minimal impact on taste would be successful in reducing salt, sugar and fat consumption amongst a population who eat many of their meals outside of their home. The results of this small study may offer hope to fast food outlets worried about new tastes adversely impacting on their sales.

Recent research by a public health master's student in Liverpool identified that some takeaway owners are receptive to the idea of improving their menus, and in fact after making small changes to their food offer had identified additional profits (45). Additionally the work by Story et al on healthy food and eating environments describes the ecological framework which influences food choice, similar to the Foresight Report's diagram. Individual factors such as placement of healthy food at eye line, or offering a healthy option with a meal deal can only impact, they argue,

when the environment in which these choices are made is supportive of the individuals desire to choose healthily (46).

In August 2016 the UK Government published its Child Obesity Strategy listing fourteen actions they planned to take in order to tackle the rising tide of obesity amongst children in the UK (47). This was followed by the House of Commons Health Committee's response which listed the eleven actions they proposed to take as a result of the strategy (48). A follow up to the original report was recently published as well (49) which summarised the actions they expect to be taken at local, regional and national level to influence the obesity epidemic. Eating too much and moving too little may appear to be a simple problem with a simple solution, but the Foresight Report: *Tackling Obesities: Future Choices* (9) made it clear that the interactions which lead to obesity are many and complex. The government's obesity strategy's focus is on changing the environment in the following four ways, 1 - making it more expensive to purchase high fat, salt and sugar foods (HFSS foods) 2 - making it easier to access healthier lifestyles 3 - reducing the availability of HFSS foods to children 4 - improving the nutritional content of food available in out of home establishments. Criticism of the lack of ambition within the government's strategy has been widely published focusing on the lack of a strong policy on national levers such as reformulation and advertising as the largest missing element.

The willingness of fast food retailers to change their food offer is vital to the success of any interventions attempting to achieve item 4 above within fast food restaurants. The takeaway toolkit as described has been available within the UK since 2011 however little progress has been made towards creating healthier takeaways; Story's paper may explain this lack of progress. They argue in their policy review paper that Macro level influences, beyond the control of the individual fast food retailer, must be taken into account when changes at the individual level (food choice behaviours) are attempted (46). This ecological approach to changing food environments is important to understand if we are to make any progress on improving the food environments in which we live. Early case studies within the toolkit itself identify the motivations and experiences of fast food retailers as a major barrier to using the guidance. These motivations and barriers to change are therefore of interest and this thesis attempts to identify and describe a fast food retailer's experience of attempting to apply the guidance from the takeaway toolkit. In this thesis a hot food retailer was recruited to receive an intervention based on the takeaway toolkit as described above in the methods chapter. Their experience of the intervention was then evaluated.

Aims and Objectives

The aim of this study is to address the research question "*What is the impact of a nutritional intervention (based on the takeaway toolkit) on a fast food retailer?*"

This question was broken down into parts:

- (1) Was the nutritional content of the foods sold in the recruited fast food retailer improved following the intervention?

(2) Was there an impact on customer numbers as a result of the intervention?

(3) What was the experience of the fast food retailer after implementing the intervention?

This thesis also systematically reviews the evidence surrounding the impact of fast food restaurants in the food environment surrounding schools in the UK, the results of this systematic review were published in the Journal of Public Health in 2018.

Their publication was noted by some interesting organisations, soon after publication a review of the findings of the systematic review appeared on the Institute of Economic Affairs website. The Institute of Economic Affairs is a right wing think tank with dubious/denied links to big tobacco and big food, they disagreed with the conclusions of the review and sought to argue the review was not correct in its conclusions and their own review recently published should be regarded as the correct opinion. However, their review was subsequently unpicked by another Public Health specialist, Greg Fell DPH for the city of Sheffield, who pointed out the lack of rigour and systematic approach and referenced this thesis's review as an example of an academically robust review on the subject (50). It was certainly interesting to experience media interest in the publication and the results of the systematic review will follow and be discussed in the next chapter (51).

Chapter 2 Systematic Review

This systematic review which was published in the Journal of Public Health in March 2018 was undertaken in order to identify the evidence base focusing on the food environment around schools. The review intended to answer the following questions

- What research has been undertaken relating to fast food businesses around schools?
- What research has been undertaken into the attempt to control childhood obesity through influencing the food environment or the built environment around schools?
- What is known about fast food and obesity in relation to schools and school children?

The methodology of this review was informed by the PRISMA (QUORUM) guidelines for systematic reviews (52).

Eligibility criteria

Exclusion and inclusion criteria listed below in table 2.1 were developed.

Table 2.1 *Inclusion and exclusion criteria for the systematic review*

Inclusion Criteria	Papers reporting impacts of food environment around schools on obesity
	Papers reporting impacts of food environment on schools

	Papers based on analysis and discussion of obesity in relation to leadership, education, attitudes and behaviours
	Papers discussing obesity views, opinions or developments in relation to the built environment's spatial planning
	Policy documents relating to obesity, children, fast food and school food cultures
	Papers published in English and relating to the UK
Exclusion Criteria	News articles
	Non English
	Letters to academic journals
	Editorials
	Commentaries
	Papers not reporting empirical research
	Papers not published in peer reviewed journals
	Rejecting studies not carried out in the UK
	Papers published before 1998
	Papers not mentioning hot food takeaway or fast food

Search strategies

Research into the food environment surrounding schools is multi-disciplinary. It was therefore necessary to ensure a wide sweep of research databases. Including the fields of sociology, psychology, medicine, and education within the search allowed for the greatest likelihood of finding all available literature. Specifying the search terms was also important. It was necessary to ensure multiple spellings and Boolean phrases which would identify as many papers as possible. Systematic searches were carried out using the following search terms:

Table 2.2 *Systematic review search terms*

Search term string	
1	Obes* OR BMI OR "Body Mass Index" OR "obesity cause*" OR "obesity attitude*" OR fat* OR adiposity OR overweight OR over-weight OR "over weight"
2	School* OR child* OR adolesen* OR teenag* OR " school* children" OR youth OR young* OR primary OR secondary
3	"hot food takeaway*" OR HFSS OR "High Fat Salt Sugar" OR A5 OR "Food environment" OR "food culture" OR environment OR "fast food" OR takeaway

Due to the interdisciplinary nature of the subject matter a wide range of databases was searched. Searches were carried out in: Cochrane Library; NICE guidance, Medline; PubMed; Web of Science; AMED; CINAHL; Embase; psycinfo; SOCINDEX; TRIP (Turning Research into Practice) BMJ. These databases cover

medical, educational and social science databases and were likely to find the most relevant papers from each field of study.

Searches were completed using all three search strings simultaneously except for the TRIP database where individual search strings were used and hand searching of returned papers was completed. This was due to the nature of the search apparatus on the TRIP database which does not allow combining of search strings.

Study identification

All search results were screened initially by checking the study titles, those that seemed irrelevant were removed, the remaining titles were collected and organised using ENDNOTE X4. Duplicates were removed and abstracts were then downloaded for further scrutiny. Any abstracts not meeting the inclusion criteria were removed. Full text copies of remaining papers were downloaded and reviewed to assess their relevance; further papers were excluded at this stage. The remaining papers were screened independently by the study supervisors who excluded further papers. Fourteen papers met the inclusion criteria; quality assurance assessment of these papers was carried out prior to data extraction, this is detailed below. See figure 2.1 for the selection process and results.

Systematic Review Results

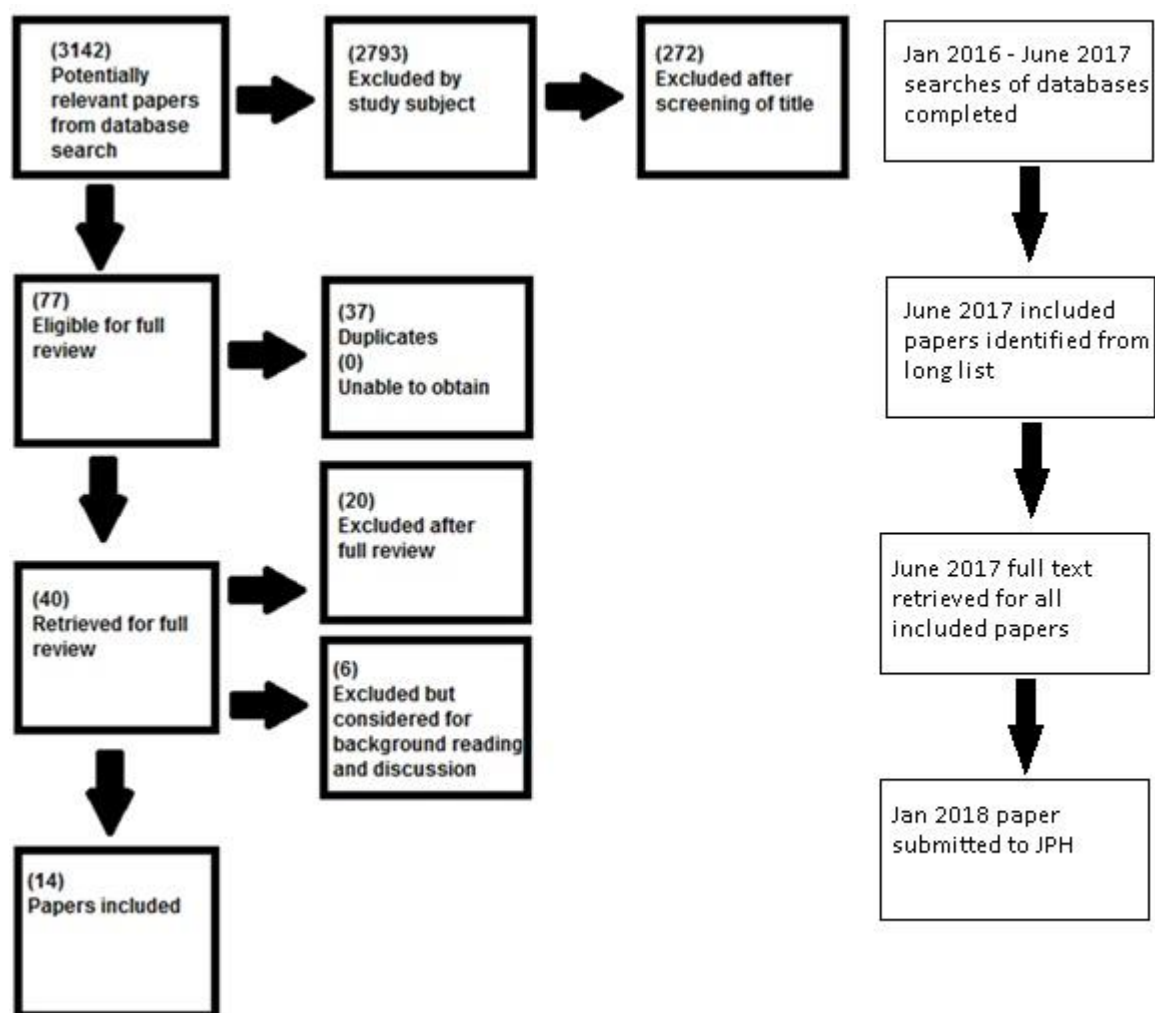


Figure 2.1 *Systematic review flowchart*

Included studies

Quality Assessment and data extraction

It was necessary to use three different quality assessment processes as included studies applied a range of methods. Observational studies were quality assessed using criteria adapted from the CRD handbook (53). Qualitative papers were

assessed using criteria adapted from Spencer's framework for Quality in Qualitative Evaluation (54). Systematic reviews were quality assessed using criteria adapted from Greenhalgh's 'Improving the quality of reports of meta-analyses of randomised controlled trials: the QUORUM statement' (55). Results are listed below in table 2.3

Table 2.3 *Quality assessment of papers included in the systematic review*

Paper	Focus	Quality Issues	Quality Rating
Fraser et al 2010 (37)	Location of hot food takeaway, Definition of hot food takeaway, availability of other food outlets	If QA of included papers was undertaken it is not described. No flow chart. Population, intervention, context and follow-up of included papers not described.	Low
Harrison and Jones, 2012 (56)	Correlation between food environment and weight	No QA of included papers carried out. No weighting of results was reported.	Medium

		Sensitivity of results was not reported	
Fraser et al 2011 (36)	Correlation of consumption of fast food and BMI	No quality issues identified	Good
Caraher and Madelin, 2014 (57)	Food environment, policy, foods eaten	Consent for focus groups was not described	Medium
de Vet et al., 2013 (18)	Correlation between self-regulation ability and self-reported food behaviour	It was not clear why and how the included schools were selected. (Possibly a convenient sample?) Validity of questionnaire used was not described.	Good
Edwards et al., 2010 (43)	Correlation between food behaviour and location of hot food takeaway	Home address used to categorise socio-economic status - can be inaccurate	Good

Ellaway et al., 2012 (41)	Description of location of hot food takeaway	No comparison group	Good
Gallo et al., 2014 (58)	Description of location of hot food takeaway	No issues identified	Good
Griffiths et al., 2014 (40)	Correlation between food environment and weight	Collapsing of food categories into one category could mask influence on BMI	Medium
Harrison et al., 2011 (42)	Correlation between physical environments around school, home and route from school and FMI	Definition of healthy and unhealthy food premises could mask influence on FMI	Medium
Macdiarmid et al., 2015 (59)	Description of school lunch time purchasing behaviour	Study focuses on identifying patterns in the data collected and describing behaviour - does not cover causes	Medium

Briggs and Lake, 2011 (14)	Description of food behaviour	No description of how analysis was completed in report. Poor description of subject's recruitment.	Medium
Devi et al., 2010 (19)	Correlation between food policies in schools and food behaviour	Study subjects were not intended to be representative	Medium
Estrade et al., 2014 (60)	Description of location of hot food takeaway in relation to schools	Struggled to recruit vendors into the study. Results may not be generalisable. Potential bias introduced due to difficulty of recruiting subjects	Good

Review findings - Study focus

Fourteen papers met the inclusion criteria. Due to the nature of the planned field of study, four descriptive categories were expected to be found within the papers.

These were (1) papers which describe problems, effects or impacts of fast food in the food environment around schools on children, communities or families, (2) papers which describe policies in food environments surrounding schools, (3) papers which describe food related behaviour by pupils, families or communities in fast food restaurants in the food environment surrounding schools and finally it was expected due to the Boolean terms used in the search process that there would be papers which evaluated interventions into the food environment related to fast food which were designed to influence one of the three categories above (environment, behaviour and policy). The fourteen papers found were categorised into the themes as described (Table 2.4) however, no papers reporting the results of interventions in the food environment surrounding schools were found and therefore there were only three categories used in the table below.

- 1) Problems, effects or impacts of hot food takeaways in the food environment surrounding schools on BMI/Weight/Obesity
- 2) Strategic policy for food environments surrounding schools
- 3) Food related behaviour by pupils or adults in the environment surrounding schools.

Table 2.4 *Included papers organised by theme, showing focus, hot food takeaway definition and variables measured*

Title	Type of study	Theme	Focus	Definition of hot food takeaway used	Variables measured
Fraser et al., 2010 (37)	Semi-systematic review	1	Location of hot food takeaway, definition of hot food takeaway, availability of other food outlets	Various: n=26 used national or international franchises only, n=1 MacDonald's only, n=5 included small independent outlets plus franchises. N=2 no definition	None
Harrison et al., 2011 (61)	Observational Study	1	Correlation between food environment and weight	Food outlets (all) - healthy = supermarkets, greengrocers and unhealthy	BMI, FMI, Height, Socio-economic

				= convenience stores and takeaways	
Fraser et al., 2011 (62)	Survey	1	Consumption of fast food vs BMI	List of foods bought by children: chips, burgers, pizza, sandwich, pies or pasties, chocolate, crisps, fruit and other food	BMI
de Vet et al., 2013 (18)	Survey	1	Self- regulation ability influence on food behaviour	Unhealthy eating = sweet and salty snacks, sugar- sweetened beverages	Weight
Ellaway et al., 2012 (41)	Observationa l Study	1	location of hot food takeaway	Food premises register - categories cafes,	None

				takeaways, food stores, multi-national fast food chains, fixed stance vans	
Gallo et al., 2014 (58)	Observational Study	1	location of hot food takeaway	Five categories - sit down eatery, convenience and instant food outlets, traditional shops, convenience shops, other food outlets	None
Griffiths et al., 2014 (40)	Observational Study	1	Correlation between food environment and weight	Food premises list - supermarkets, takeaways and	BMI

				retail(including petrol stations)	
Estrade et al., 2014 (60)	Observational Study	1	Location of hot food takeaway in relation to schools	Independent establishments selling foods prepared on site for takeaway consumption during the school lunch period	None
Caraher and Madelin, 2014 (57)	Triangulation of observations	2	Food environment, policy, foods eaten	Food premises register - category takeaway	Food premises visited by school children during lunch times
Edwards et al., 2010 (63)	Survey and Observational Study	3	Food behaviour and location	No definition given	BMI

			of hot food takeaway		
Harrison and Jones, 2012 (56)	Systematic Review	3	School's physical environment s and behaviour	No definition given	None
Macdiarmi d et al., 2015 (59)	Survey	3	School lunch time purchasing behaviour	No definition given	BMI
Briggs and Lake, 2011 (14)	Descriptive Study	3	School food behaviour	No definition given	None
Devi et al., 2010 (19)	Observationa l Study	3	Food behaviour	No definition given	None

Main findings from the evidence contained in the included papers

Theme 1: Problems, effects or impacts of hot food takeaways in the food environment surrounding schools

Definition of hot food takeaway and the food environment surrounding schools

The definition of hot food takeaway used in all papers was heterogeneous.

Edwards, Macdiarmid, Briggs, Lake, Devi and Harrison did not define hot food takeaways although they referred to them within the text of their papers (14, 19, 42, 43, 56, 59). Harrison, Jones and Griffiths categorised hot food takeaways and corner shops as unhealthy and supermarkets and green grocers as healthy (40, 42, 56). Fraser found children accessing supermarkets to purchase crisps, chocolate and fizzy drinks therefore the categorisation of a supermarket as healthy may mask health impact (37, 62). The Food Standards Agency standardised coding category allows any hot food to be sold; healthy or unhealthy in a hot food takeaway (64). For the purposes of this study Lake's definition of Hot Food Takeaway will be used (14).

Describing the food environment surrounding schools

Caraher, Madelin, Ellaway, Griffiths, Harrison, Jones and Gallo all used food premises registration data held by the local authority to describe the food environment surrounding schools (40-42, 56-58). Harrison used the yellow pages to confirm the location of hot food takeaways (42). Harrison and Gallo carried out a foot survey recording the location and type of all food businesses within the survey area (42, 58).

Body Mass Index (BMI) and Fat Mass Index (FMI) as measures of childhood obesity

Using anthropometric measures Harrison, de Vet, Fraser, Edwards, Griffiths and Macdiarmid categorised children's obesity/overweight status (18, 37, 40, 42, 43, 56, 59, 62). Harrison et al used both BMI and FMI to categorise their study participants (42). FMI is calculated by dividing fat mass by the height of a person, this is different to BMI where weight is divided by height to categorise. Fat mass is measured by the use of bioelectrical impedance assessment (BIA). Edwards, Fraser, Griffiths and Macdiarmid used BMI to categorise children in their studies (37, 40, 43, 59, 62). De Vet used weight (18). BMIs were calculated using secondary data from existing screening programmes such as the National Child Measurement Programme (NCMP) or its local antecedent.

Theme 2: Strategic policy for food environments surrounding schools.

Regarding exposure to hot food takeaways Fraser and Edwards found that children in schools were exposed to more hot food takeaways than they expected and they suggested this had implications for future policies relating to obesity control (37, 43, 62). This finding was supported by Ellaway who found in Glasgow there are on average 35 food outlets within a ten minute walk of each secondary school (41). Harrison found some associations between FMI and the design of home and school environments, with the strongest associations observed amongst the girls in her study (42). Griffiths et al found in their review that while consumption of fast food may be associated with obesity the evidence from the papers they found was not strong enough to say that exposure to fast food and other food outlets in the

home, school and commuting neighbourhoods increases the risk of obesity in children (40).

Regarding the design of the school fringe, Gallo described the school fringe environment in the UK and found the provision of 'traditional sit down eateries' was more common in affluent neighbourhoods, and there were more 'Convenience and Instant food outlets' in deprived areas (58). Harrison et al's second paper included in this review suggested the physical environment of schools has an impact on children's diet and physical activity; however the hot food takeaway element of this study was very small (56).

Regarding the wider public health approach to hot food takeaways Caraher identified the need for a comprehensive public health strategy which linked across formal public health services and local authority planning services in order to impact on the foods eaten by children during the whole school day. Caraher also recommended nutrition and education services be involved in any programmes designed to impact on obesity in children (57).

Edwards and Clarke recommended that solutions to the currently obesogenic environment around schools be designed specifically for each geographical area, raising issues of the generalisability of their work. They warned what was successful in one food environment may not work in another; they cautioned that their work in Leeds was not generalisable unless local issues are taken into account as well (43).

Regarding profitability of food businesses Devi et al concluded that if pupils are treated as consumers there is an impact on school catering services as pupils are

able to undermine the financial viability of their school's catering service (19). This acts as a lever to force canteens to produce food which is both popular and profitable; in today's society this is likely to be highly processed and unhealthy. Devi and colleagues concluded that treating pupils as consumers will ultimately undermine any health promoting ethos within the school canteen setting. Estrade and Dick offered a similar conclusion in their paper focusing on independent food shops in disadvantaged areas of Glasgow. They found business owners faced significant barriers to offering healthy food choices including competition and pricing policies within neighbouring businesses (60).

Theme 3: Food related behaviour by pupils or adults in the environment surrounding schools.

Regarding food behaviour amongst children De Vet and colleagues found that easy access to unhealthy food products was associated with a higher recorded consumption of unhealthy foods. This was contradicted by the evidence in the Griffiths review which found a lack of evidence of a link between increased exposure to fast food and increased consumption of fast food (18, 40). De Vet found this effect was lower amongst children who used self-regulation strategies to facilitate healthy eating. Additionally Fraser found teenagers who ate at hot food takeaways consumed more unhealthy foods and were more likely to have higher standardised BMI or BMI SDS (the SDS referring to BMI standardised for age) than those teenagers who did not eat frequently at hot food takeaways (62). In contrast, Macdiarmid found that the pupils in their survey reported most often purchasing food or drinks at supermarkets (59). They also found less than 10% of the

secondary school pupils in their survey purchased high sugar foods, such as non-diet soft drinks and confectionery, every day at lunch time. Macdiarmid concluded there is a need for wider public health strategies to improve the dietary intakes of young people across the whole day, not solely during school hours. This was supported by the work carried out by Briggs which showed the children in their study had extremely varied home food environments. Briggs concluded that parents were the key moderators of (children's) food availability and accessibility (14).

Systematic review discussion

This review found that analysis of interventions that impact on the food environment around schools is missing from the literature, however the review had not specifically looked for interventions but had assumed they would be found due to the nature of the Boolean terms used during the review. Most studies included in this review compared anthropometric measures with geographical location of hot food takeaways in order to search for correlations between environmental factors and obesity in children.

Through following a specific and broad search strategy this review aimed to locate papers focused on the hot food takeaways in the environment around schools in the UK. These areas have become the focus of attention since the first UK local authority used the planning legal process to prevent the development of fast food retail outlets in their borough (65). This review aimed to build on the evidence already published on this topic and provide insight into the potential focus of future studies. The design of the review was intended to provide the widest selection of

relevant papers; the papers identified show much is known about the design of the environment surrounding schools, comparisons between deprived areas and less deprived areas were well represented in the papers found. The location of fast food outlets in relation to schools has been repeatedly documented and described.

The literature also indicates that the definition of hot food takeaways varies considerably between studies. This makes comparing results difficult and may be obscuring the link between fast food geography and weight status.

BMI was used as the obesity comparator because it is non-invasive, easy and cheap to gather, it consists of taking the height and weight of a person and comparing them using a standardised method. BMI however has drawbacks when used to categorise children (66). The use of BMI to describe children's health status can be biased, as body composition changes substantially as children age and body composition is more important in the analysis of BMI in children. BMI takes no account of different body shapes, puberty or ethnicity which all affects the accuracy of a BMI calculation in children (67).

FMI is rarely used in a clinical setting so is used in studies where primary anthropometric data is going to be collected. According to Cole and colleagues, using the percentage of fat body mass to calculate obesity is the ideal weight categorisation tool. However fat mass percentage is impractical to obtain within clinical settings for epidemiological use. Percentage fat mass is measured by passing a low voltage electrical current through the body, electrical resistance is equated to percentage fat. Results can be biased by hydration status (66).

BMI status is a distal measurement and it does not change quickly, it has been difficult to prove a causal relationship between obesity status in children and adult disease (65, 67). Small changes monitored in a short time period (for example 12 weeks) often do not equate to changes over a long period (for example 12 months). It is therefore difficult to rely on short term changes in BMI as a measure of the success of an intervention. Proximal measurements such as eating behaviour and food purchasing behaviour may be more accurate measures of the success of an intervention, however these are difficult, time consuming and expensive to collect. This may explain why so many of the included studies relied on BMI. Using publicly available geographical data about fast food retail locations to identify saturation of hot food takeaways in a geographical location also has limitations. For example it is 'point in time' data; the local authority knows what food the premises was selling at its last food hygiene inspection but this inspection could be up to two years old at the time of data collection. The accuracy of the geographical information therefore varied between studies.

The design and building of the environment within our cities is an evolving process. Planning policy is difficult to change; years may pass between the first Governmental inclination to change a policy and the change. Several more years may then pass before the built environment is significantly impacted by the policy. Townsend and Lake identified some of the intricacies in the relationship between health and planning policy in their 2017 paper (68). The return on public health to local authorities presents an opportunity for reuniting the planning profession with its roots in health. The time required to make a change to planning policy however

makes the study of the impact of planning restrictions on hot food takeaways and health difficult to analyse and time consuming. This is reminiscent of the history of the study of exposure to cigarette smoke and its impact on health. Tobacco smoking was identified as harmful to health in the 1940s and 1950s. The prevention of exposure to tobacco smoke in the working environment was a hard won change to the built environment and was legally enshrined in the Health Act 2005 (69). In the same way the correlation between fast food retail location, fast food consumption and obesity is still disputed. This lack of evidence may however indicate the inability of many papers to measure the impact of hot food takeaway exposure accurately. Cohort studies such as the Fenland Study, Cambridgeshire (70) and the Avon Longitudinal Study of Parents and Children (ALSPC) (71) are beginning to identify more substantial evidence for this link but it is likely to be a long road.

Conclusions relating to the Systematic Review

Despite the lack of good evidence on hot food takeaways and health, planning policies around the UK are slowly being changed to reduce exposure to fast food, a review by Medway Council in 2013 found 21 local authorities in England with a hot food takeaway related policy in place (Ross, 2013 quoted in (3)). It is therefore timely to investigate the impact on children's food consumption of interventions that change the food environment outside the school grounds.

In future studies the location of hot food takeaways should be confirmed and the 'healthiness' of foods available within food premises should be rated. It should be noted the assumption that all hot food takeaways sell solely unhealthy foods could

be masking the relationship between unhealthy hot food takeaways and obesity in the same way that an assumption that convenience stores or supermarkets sell only healthy food could be masking their relationship with obesity.

Future research should investigate the impact of spatial planning around schools on food behaviour amongst the population. Furthermore, a standardised definition of fast food such as Lake's should be used in future studies as this would allow comparisons between data sets (14).

Analysis of the impact of changes to the food environment around schools should be carried out. Some data are available from existing cohort studies where food behaviour has been collected over several years along with anthropometric measures.

The interaction between children's food behaviour and the built environments within cities continues to be an important part of understanding what causes obesity. The literature provides good evidence that there are higher numbers of hot food takeaways in more deprived neighbourhoods. Furthermore although it was not part of the research question for the systematic review the literature clearly showed, children who live, work and socialise in deprived neighbourhoods tend to eat more fast food and tend to have higher BMIs (51). Few studies found were able to adequately quantify a correlation between the food environment surrounding schools and obesity amongst pupils attending those schools. The lack of reliable evidence found in this systematic review regarding the impact of hot food takeaways in the food environment around schools on obesity in children attending those schools is more a factor of the ability of the studies found to identify the

correlation between geographical locations of hot food takeaways around schools and obesity in school pupils than the actual lack of a correlation between these two variables.

A robust evaluation of the impact of a nutritional intervention within a fast food retailer is timely and valuable to this field of research. As identified above this type of study was expected to be found in this systematic review, even though it was not overtly designed into the research question. It was expected that any intervention into a fast food retailer would be found due to the Boolean terms used. It appears therefore that this type of paper is rare within the literature that was found during the systematic review. The Hillier Brown et al systematic review of interventions in the food environment found only one uncontrolled study conducted in England (72). This current study therefore is intended to begin the process of gathering evidence about an intervention into the fast food environment, and attempts to fill this gap. The next chapter will explain what methods were used to carry out the thesis study and the rationale for choice of methods.

Chapter 3 : Methodology and Methods

This chapter will present the research methodology used in this study, and critique how a range of methods were considered prior to deciding on the most appropriate approach to address the aims of the study.

The aim of this study was to investigate the impact of an intervention which implemented a 'takeaway toolkit' approach with a fast food retailer in Plymouth.

The literature review in the previous chapter found papers that had investigated the existence of a link between fast food retailers and childhood obesity; however critical appraisal of the published literature indicated an absence of studies of a high quality which investigated nutritional interventions in fast food restaurants.

Hillier-Brown published a systematic review looking for interventions in 2017 and found 34 in 30 papers, however the majority had been carried out in the US which was not within the scope of the systematic review carried out in this thesis, they found that interventions which focused on guiding choice through incentives/disincentives were the most effective (73). Within the grey literature there were a few small-scale nutritional interventions which had been undertaken by local authorities in fast food restaurants, some of these had been published as case studies but had not been robustly evaluated (34, 39, 45, 65). Whilst this thesis was being undertaken a paper was published by Newcastle University which robustly investigated the perceived barriers to the implementation of nutritional interventions in fast food restaurants amongst professionals who deliver these interventions (74).

One paper relating to the voice of the fast food retailer was found within the academic literature, a paper by Bagwell which had interviewed fast food retailers in Scotland (34); again a few publications within the grey literature had recorded the results of interviews with fast food retailers. These tended to be based around London in areas with intense competition between retailers (57, 75).

The Takeaway Toolkit

The intervention used in this thesis was taken from the 'Takeaway Toolkit' (39) which was published in 2011. The toolkit was written using evidence on nutritional interventions collated by the Chartered Institute of Environmental Health along with the Local Government Association in London, there was little evidence of critical analysis of the research behind the contents of the toolkit. It has been used throughout the UK to design healthy catering schemes and carry out nutritional interventions in fast food retailers since its publication. The toolkit gives recommendations on how environmental health practitioners (or others) can influence the obesogenic environment through three approaches; a) give advice to food retailers on a range of measures which can potentially reduce fat, salt or sugar content within meals being sold to the public b) influence schools to reduce the amount of fast food children have available to them during the school day c) use regulatory and development planning measures to prevent the proliferation of fast food retailers in the food environment.

In 2017 this toolkit was recommended by PHE in their guidance on creating environments which encourage healthy living (2). A follow up publication has been

written (34). It details a series of case studies from locations where the toolkit has been used successfully.

The toolkit consists of a number of case studies from local authorities which indicate potential changes which can be recommended to a fast food retailer to make the food they sell less harmful. Some of the suggested interventions have completed nutritional analysis through taking of food samples and measuring of nutritional content. This has been done on an adhoc basis though and none of the measurements reported in the grey literature were identified in the academic literature. Part of the purpose of this study was therefore to robustly evaluate whether using the guidance in the takeaway toolkit had a measureable impact on the nutrition of food purchased in a fast food retailer.

Choosing the intervention for the study

This study evaluated the impact of a nutritional intervention based on the guidance in the takeaway toolkit where the customer was covertly affected. The intended process of the intervention was as follows: the customer chose a regular item from the menu but was (unknowingly) served a healthier version. The process of cooking or serving of the food item had been adjusted in the kitchen (39). This same mechanism was investigated by Goff et al when they changed salt cellars with 17 holes for ones with 5 holes to reduce salt added to food in takeaways. This unknowing change resulted in only 33% of the original serving of salt being served by customers (34, 76). It was assumed this adaptation would result in a change to fat, sugar, salt and fibre content per portion which would potentially reduce the customer's intake of these nutrients.

Philosophical position

Working within both an Environmental Health and a Public Health team fostered the author's understanding of how food environments interact with those who live in the local area.

The target of the intervention evaluated within this study was the fast food retailer; however the end point was the consumer. The information collected during the research had to be sufficient to address the research question "*What is the impact of a nutritional intervention (based on the takeaway toolkit) on a fast food retailer?*" In choosing the most appropriate way to gather this information it was necessary to identify an appropriate research design (77).

Consideration of appropriate theoretical frameworks

In order to minimise researcher bias and ensure a robust research method was chosen it was necessary to identify the appropriate theoretical framework within which this research sits (78). Creswell defines the four general frameworks in his definitive publication on designing research (79) these were; Positivism/Post positivism, Constructionism, Transformativism and Pragmatism but other methodology experts have also explained them in detail not least Mertens and McLaughlin (80). Each of the four philosophical frameworks have specific research methods associated with them. Identifying the appropriate framework therefore influenced the research methods (and approach) which was ultimately chosen. Positivism, which has been the dominant paradigm within health research, is based on the premise the social world is fundamentally the same as the natural world. This means the social world can be studied using the same methods as natural

scientists use; experiments, randomisation, prediction and control. Positivism focuses on the measurement of phenomena in order to describe and predict them (81). Positivists also look for the causes of phenomena through testing theories using experimental methods (78).

One of the factors being investigated in this study was the impact of a change in cooking/serving method. Impact could be on a number of variables; the customer, the business, the fast food retailer. The nutritional content of the food served, the amount of food sold during the study period, the number of customers visiting the takeaway could all be measured. This provided valuable information regarding investigation of the research question. These measureable elements fit with the positivist framework. However another factor of interest is the experience of the fast food retailer in applying the recommended changes in the real world. This experience is subjective; in order to understand the fast food retailer's experience they will need to express this in some way to the researcher. It is difficult to 'measure' or 'quantify' this experience and if measured or quantified it is debatable whether this would be useful in understanding the impact of the intervention on the fast food retailer. Therefore a different framework would be more appropriate for this aspect of the study.

Constructivists see the social world as something which has been 'constructed' by humans through their interaction with their environment (79). They believe people create subjective interpretations of their own world and seek to understand the world around them as it relates to their experience of it (79). Constructivist research is most commonly associated with qualitative research methods where

study subject's words and experiences are collected for analysis (82).

Constructivist research tends to aim for the fullest description of a phenomenon as described by those experiencing it (82, 83) and therefore this is a much closer fit for the understanding of the fast food retailer's experiences.

The transformative framework is similar to constructivism in that it is largely associated with qualitative research methods, however it was created in response to a recognition that research is a way of empowering marginalised groups who have no voice in the social world (84). Transformative research will often include political or personal agendas at the design stage by starting from a particular viewpoint, for example the feminist work of Kelly and Burton in 1994 as quoted in Mertern's 2015 book on transformative research(85). Transformatives acknowledge explicitly that all research has inherent bias, researchers themselves influence what is researched because of their own interest in the subject they have chosen to research, and therefore any attempt to reduce this bias is futile and instead should be embraced (79). They will frequently include their study subjects in the design of their research, believing that the outcome of research should be to 'transform' the experience/lives of their subjects, drawing attention to oppression, disparity, alienation etc. (85). Qualitative research methods such as ethnographic, phenomenological or participatory action research are most associated with this framework.

The proposed study, whilst rooted in a political process (the economic viability of a small business within the UK), does not start from a political opinion; it does not seek to expose oppression, disparity or alienation. Therefore the transformative

framework is not appropriate. In contrast, this study contains elements which fit within the Positivist framework and elements which fit within the Constructivist framework. Therefore it needs a framework which can encompass both.

The Pragmatist framework tends to focus on describing a situation, problem or solution in as great a detail as possible (79, 85). Pragmatists are not committed to any particular philosophical approach and will usually take a solution focused approach to research. This means they will use elements of Positivist, Constructivist or Transformativist's frameworks as and when necessary (86). Mixed methods are associated most strongly with this framework, as they incorporate different elements from each framework and allow for triangulation of data.

Due to the nature of this study it contains elements which fit comfortably within a positivist framework and elements which would fit most comfortably within a constructivist framework, therefore a pragmatic framework (which mixes these two frameworks) would be the most useful for this research (79). The benefits of triangulation include increased reliability of data when combined which allows for more robust conclusions to be drawn (79). There can also be drawbacks to the use of mixed methods; the integration of different types of data can be difficult to achieve often resulting in the 'quantification' of qualitative data. It requires innovative thinking to combine these different data types and understand what the combination is saying about the topic studied. This study as discussed below takes a pragmatic approach which sees quantitative and qualitative data as being either end of a spectrum of data (87).

Research approach

Having identified Pragmatism as the best theoretical framework for this research it was necessary to identify an appropriate research approach. There are three potential approaches to research: quantitative, qualitative and/or mixed methods (77, 86). According to Creswell (79) “*qualitative and quantitative approaches should not be viewed as rigid, distinct categories, polar opposites, or dichotomies. Instead, they represent different ends on a continuum... Mixed methods research resides in the middle of this continuum because it incorporates elements of both qualitative and quantitative approaches.*” It was necessary to identify which research approach was most relevant to this study.

This study used quantitative methods to measure the changes in the nutritional content of the food sold by a hot food retailer in the study. It also used quantitative methods to measure numbers and record demographic information of customers purchasing food from the study’s retailer. This data allowed statements about whether there was an increase or decrease in food purchasing behaviour or nutritional content following the intervention. The drawback of this data was that it did not explain why any identified changes occurred.

In contrast qualitative research methods rarely use numerical data. David Silverman describes qualitative research as a ‘window’ through which we might ‘see’ whilst he also questions whether qualitative research is about reporting and analysing data or whether it is about story construction and story-telling (88). Gubruin and Holstein identify ‘meaning making’ as the goal of qualitative methods (89). In their Handbook of Interview Research: Context and Method they describe

how interviewing can contribute to gathering information which will allow for 'meaning making'. The audience for this report is the wider public health community, specifically those who may seek to work with fast food retailers in the future so they may use the information discovered to create more successful interventions. It was important to acknowledge this purpose in order to recognise how it may have influenced both the study design and the data analysis carried out.

Interpretative interactionism, which Silverman defines as 'making the world of problematic lived experience of ordinary people directly available to the reader', is a good description of the purpose of the qualitative data gathering in this study (88). In order to communicate with those who seek to make changes within takeaways, the fast food retailer's experience of living through some of those changes was of specific interest. As previously discussed there were no peer reviewed papers which had presented this data previously, during the study a paper was published by Newcastle University which reported the results of interviewing 11 professionals who deliver nutritional interventions within food premises to identify the barriers they have perceived during their work. This thesis's design was by coincidence similar to the methods adopted in this study. Through analysing stories and personal experiences qualitative data allowed for understanding rather than measurement (89). Understanding how or why an outcome occurs is just as important as being able to measure the impact of the occurrence. Within this study the explanation of why the fast food retailer took the

actions they did and how that impacted on them could only be collected using qualitative methods.

Using a mixed methods approach selecting appropriate qualitative and quantitative data collection methods provided the fullest way of identifying the impact of the intervention and consequently answering the research question.

Research methods

Having identified mixed methods as the appropriate research approach the next step was to identify appropriate specific research methods. In order to choose research methods for the research question “*What is the impact on a fast food retailer of the implementation of guidance from the takeaway toolkit?*” potential sources of relevant information and variables were identified.

There were three potential data sources identified about fast food consumption in the area:

- (1) The experience and / or behaviour of customers who purchased food within the study business
- (2) The nutritional content of the food for sale
- (3) Fast food retailers located around a primary school and their knowledge/opinions and experiences about the food they sell and their customers

Designs used in previous studies

Identifying an appropriate fast food retailer to work with

As previously identified; within the journal and grey literature there were several published case studies (2, 34, 45, 73) where the takeaway toolkit had been implemented. One case study in particular at Magherafelt District Council in Northern Ireland had used a study design which when analysed was determined to be suitable for adaptation for this study. The local schools were surveyed to identify the local hot food takeaways their pupils frequented; this revealed the names of 27 hot food takeaways. An undercover food sample was taken from each of the 27 takeaways to identify the nutritional content of the food being served. All 27 takeaways were approached to receive a free intervention based on the guidance in the Takeaway Toolkit. A number of the takeaways accepted the offer. Food samples were then repeated. The case study reported improvements in the nutritional content of food items sampled from premises who had attended the nutritional training intervention, however it gives no information about which premises were sampled at follow-up and why. No follow up with the school pupils was reported. The research design in this case study had been successful in identifying which fast food retailers were used by local children. It was important that the fast food retailer who was to become the focus of the thesis study was frequented by local children; this would allow for an investigation of whether the food purchased by children in the study area could be changed. It was therefore decided the method outlined in the Magherafelt case study would be adopted in the thesis study to identify a suitable fast food retailer to work with. A survey would

therefore be used to identify the fast food retailers being frequented by pupils and a before and after food sample would be used to identify any improvements made as a result of the intervention (the food sample method will be discussed further below).

Behaviour of customers

In order to identify the behaviour of customers at the fast food retailer, participant observation (covert surveillance) was investigated as an appropriate research method (37). Participant observation; where the researcher is located in the environment to be studied and watches and records what they observe about the study participants was described by Becker and Geer in the 1950s and 60s in a series of papers which sought to justify its use within social research (90), participant observation allows for information about customer behaviour which would not be available through other research methods to be gathered. It has the advantage of having minimal impact on the business and allows for the collection of data on numbers and demographics of customers during the after school period. There were two possibilities for observation, covert or overt. A covert observation location was chosen to maintain distance between the researcher and the takeaway. This was to reduce the likelihood that the researcher's presence in the takeaway would impact on the numbers of customers entering the premises.

Experience of customers

The experience of customers within the fast food outlet was a potential source of information, however the voice which was almost entirely missing from the

literature was the fast food retailer. Only one paper focusing on the fast food retailers experiences or opinions about obesity was found during the systematic review; (91). It was therefore determined because the focus for this study was the experience of the *fast food retailer* that within the context of this study the customer experience data would not be pursued.

Nutritional Content of Food

There were several methods available which would allow for nutritional content of food to be estimated, measured or calculated. Each was considered. Using a laboratory to analyse nutrients in food samples was determined to be the most accurate and simplest way to identify any changes to food after the intervention however analysing food has a cost implication, as a small scale study with no budget for laboratory tests the Local Authority were approached for assistance. They agreed to fund analysis of two food samples, one before the intervention and one afterwards to identify any changes. This determined the size of the study, restricting it to one premises however for the purposes of this thesis it was determined a case study approach where one fast food retailer was investigated was appropriate. A larger study would have been too large for a ResM study capacity.

An alternative to laboratory tests which was considered was using the 'mixing bowl calculation' method. The mixing bowl calculation is defined within the food labelling regulations 1996 (92) where food retailers are required to list the amount of each ingredient of a composite food through identifying the proportional weight of the ingredient within the product at the 'mixing bowl' stage. This is a method which

allows for legal exemption for food retailers to make quantity declarations about their food without having to access expensive laboratory testing facilities. The use of this method within this study would have resulted in a less precise measurement than the laboratory tests provided, but it would have been financially cost free to complete.

The final alternative was to rely on anecdotal reports from the staff in the shop on the changes they had made. Anecdotal reports of behaviour can be useful in research, and can provide significant insight into a setting; as explained by Enkin in his paper on anecdotal evidence in clinical settings (93) and the use of anecdotal evidence is recognised as a research method, however as evidence it is often unreliable (77). Within this study the use of anecdotal reports would have been cheaper and easier to collect than laboratory testing, it was therefore appropriate to consider it as a method for this data collection. However because this data was able to be operationalised (i.e. Salt content or fat content could be measured) it was therefore appropriate to use the most reliable evidence rather than anecdotes which would rely on the person who had cooked the item estimating how much they have added and honestly reporting. Laboratory analysis allowed for the identification of changes in the food composition before and after the intervention. This research method choice restricted the size of the study to one premises, however this was deemed to be an appropriate scale for this thesis.

Experience of fast food retailer

It is assumed the fast food retailer knows how their business functions, they also know what actions they took following the intervention and what they were thinking

and feeling during this period. The experience of the fast food retailer was the main focus of the thesis study because as discussed above through the systematic review it was apparent there was very little research which had been carried out to gather the fast food retailer's experience. The elucidation of their subjective feelings was an important element in understanding the impact of the intervention. It was determined the most appropriate way to do this was using qualitative methods which are more suited to gathering the thoughts and feelings of a study subject. A number of potential qualitative methods were assessed.

One of the considerations regarding the gathering of data in this study was the perceived need to minimise the impact on the fast food retailer of data gathering. Due to the researcher's experience working with food business operators within the food environment in Plymouth and the grey literature (34, 45) time/ lack of time was expected to be a barrier to change within sole trading fast food retailers, because sole traders find time constraints to be a major difficulty when running their small business. It was assumed therefore that the fast food retailer would not have a lot of time available to be involved in data collection for a research study. A decision was made to use research methods which minimised contact time with the fast food retailer. In making this decision the researcher acknowledged that in her previous experience as a food hygiene inspector; food business owners were often reluctant to take time away from managing their business for any other purpose, regardless of the nobility of that purpose. It is acknowledged that a different researcher may have made a different decision on this issue.

Qualitative methods include any research activity which gathers the thoughts, feelings, experiences, or opinions of study subjects (88). They are diverse including methods such as interviewing subjects, running focus groups, ethnography, photograph elucidation and many more. The common factor amongst qualitative research methods is the collection of the subjects own words to describe their experience of the matter being studied. In this study it was determined based on the reasoning above that a semi-structured interview would be the least intrusive approach to gather the manager of the fast food retailer's experience of the intervention and consequence changes to his business.

This study was designed in order to collect two facts about the fast food retailer in the study area. These were: 1 - how many children visit the premises in the post school period, 2 - Following the intervention were any changes to the nutrition of the food identifiable. These facts were identified using the quantitative methods of 1 - a footfall survey and 2 - a food sample as described above. In addition to this, in order to meaningfully frame these facts within the context of the fast food retailer environment, an interview gave salience and allowed for understanding of why any changes identified by the quantitative research methods had occurred. Odum and Jocher gave one of the first definitions of the purpose of an interview in 1929 when they said it is "... *made for the purpose of securing information...about the informant himself, or about other persons or undertakings that he knows or is interested in*" (89). Gubruin and Holstein define an interview as "*a face to face conversation with a purpose. The exchange is designed not so much to collect the*

facts...as to gather information that meaningfully frames the configuration and salience of those facts in the interviewees life” (89) page 57.

As discussed above, a one-to-one interview allowed for information to be elucidated in a quick and robust manner. A face to face interview was chosen over a telephone or email interview because, as Singleton and Straits described in 1999 *“face to face interviews offer more flexibility in terms of question content...and enable unobtrusive interviewer observations of the respondent and their surroundings.” (89).*

The choice to use a semi-structured interview (rather than an unstructured interview) gave some format to the conversation but allowed for flexibility throughout.

Rubin and Rubin emphasise the importance of the design of questions in an interview. They identified three types of questions 1 - Main – which begin and guide conversation 2 - Probes – where the interview clarifies or requests further information and 3 - Follow-Ups – which follow from information provided within the interview (94). To enable a good flow of information from the fast food retailer during the interview in addition to the five main questions there was flexibility to include ‘Probes’ and ‘Follow-up’ questions due to the semi-structured method adopted. In addition at the end of the interview the retailer was asked to add anything they thought had been missed out during the conversation. The interviewer used five predesigned main questions as follows:

1. What changes did you make to the food you serve?
2. How did you feel when you made the changes?
3. How does it feel to be a fast food outlet in the era of childhood obesity?
4. What influences you when deciding what to put on the menu?
5. Do you have anything you would like to add?

Probes and follow-up questions were used in addition to these structured questions.

The interview was audio-recorded using a Dictaphone and a smart phone (mainly for convenience reasons), however there can be issues related to recording interviews. Warren describes an issue she encountered during her research where interviewees would use the electronic recording device to delineate between 'on the record' and 'off the record' nearly always adding extra information after the recording device had been switched off (89). It was therefore important to have paper and pen back-up available to record any 'off the record' comments made by the fast food retailer.

The interview was carried out by the researcher who had prior experience of interviewing fast food retailers about their practices in an inspection context. It was important that rapport was established, and this was done in the pre-recording period where 'small talk' was used to relax the interviewee and create a comfortable situation for sharing thoughts and opinions.

Transcription of the interview was carried out using ExpressScribe software and equipment. The transcript was then uploaded to nVivo for analysis.

Research strategy and design

The research process

The study had two stages, each with several steps; see the flow chart in Figure 3.1 below.

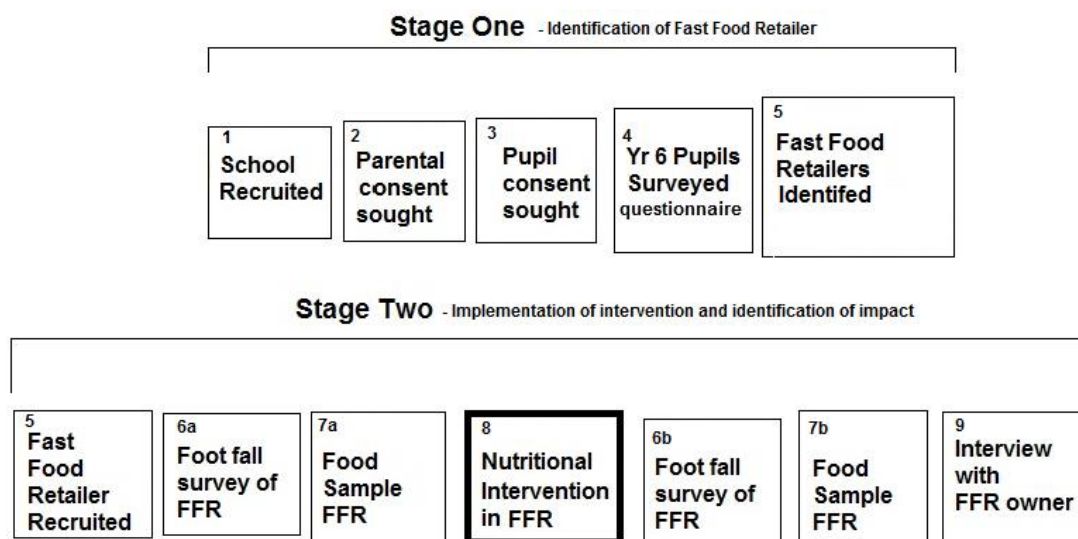


Figure 3.1 *Flow chart showing the study activities*

Stage One - Identification of the fast food retailer

As discussed above the study design was adapted from the existing Magherafelt case study which surveyed pupils at local schools to identify which takeaways they ate from regularly. It was decided to use this method to identify a fast food outlet for the study. An existing electronic questionnaire was identified from the School Health Education Unit (SHEU) the private research unit which has carried out pupil surveys on behalf of the schools system within Plymouth for the past six years and

which was therefore already in use within the study area. Fifteen questions were selected from the existing questionnaire to gather information on the pupil's level of fitness, eating preferences, physical activity opinions and behaviour. The final question asked pupils to select from a list of all the food premises in the study area to identify which premises they had eaten from in the past month. This list was created from a foot survey around the study area where all takeaways and food premises were listed.

1. Recruitment of study primary school

Pupils were surveyed from Year 6 of the study school to identify which takeaways they had eaten from in the previous month. The school was recruited using a convenience sample approach (95). The School Leadership Team were present at a schools meeting where the study was explained and volunteers were requested. The School Head teacher submitted an expression of interest. Year 6 pupils were chosen because they are the oldest children in the school with the highest literacy levels which would make completion of the survey easier for them. They were also the most independent due to their age and it was expected they would be the most autonomous in their food choices.

The school is located in one of the most deprived wards in Plymouth and it was therefore decided to complete the study in this location. The 400m Euclid circle around the primary school was used to delineate the study area.

A foot survey of the study area was completed and a list of all food premises within 400m of the school was created see Table 4.2

2. Parental Consent was gained

A letter explaining the study was sent home to parents one week before the data collection to request their consent for their children to be surveyed. The potential benefits and disadvantages were outlined in the letter along with a consent form for them to complete and return. If it had been required the consent form would have been provided in a second language. There was no request for this made. A copy of the form is included in the appendices.

3. Pupil consent was gained

Pupils who returned a signed parental consent form were given an information sheet which explained the study in simplified language, the form explained how their data would contribute towards the study, how they could withdraw if they wished and how they could get more information about the study if they wanted. Pupils were offered an alternative activity if they did not want to participate. They were then asked to complete their own consent form and return it to their teacher who then facilitated their participation in the survey.

4. Pupils completed survey

Once all the consent forms had been completed all eligible children were asked to complete the survey on a school computer during a lesson (see data collection tools section on page 79 below for more detail). The children's teacher was available to answer any questions raised during the lesson and a safeguarding policy was in place to ensure children could access support should any question prove to be emotive for them. Responses were anonymous.

5. Identify fast food retailers frequented by pupils

From pupil's responses to the questionnaire a list of food premises with primary school age customers was created. The list was organised in order of frequency with most frequented premises at the top and least frequented at the bottom. This list was used in Stage Two of the study.

Study stage two

5. Fast food retailer recruited

All fast food retailers on the list produced in stage one were approached to participate in the study. The following exclusion criteria were used when recruiting the fast food retailer.

- (a) Any fast food retailer who did not have the power to make changes to menus and food processes was excluded. This excluded the national chain fast food retailers such as Pizza Hut or KFC from participation as there was no local power to make these changes.
- (b) Any fast food retailer who did not serve food referenced within the takeaway toolkit with recommendations which could be made regarding improved nutrition was excluded.
- (c) Any fast food retailer who was not willing to participate in the study, and make changes for the purposes of the study was excluded.
- (d) Any fast food retailer which was not frequented by pupils at the study school was excluded; this was identified from the questionnaire.

The most frequented premises had been frequented by 22 out of 24 pupils however they were part of an international fast food chain and therefore were excluded. The second most frequented premises had been frequented by 9 out of 24 pupils and was a sole trading fast food retailer who was willing to participate when approached and therefore was chosen as the premises to receive the intervention.

The fast food retailer was approached by a qualified environmental health practitioner who had no prior contact with the premises. This was important because the researcher had a previous relationship with the premises due to her many years' experience as an environmental health officer regulating the food environment in the study area. It was determined that due to this previous uneven relationship (where the fast food retailer was legally required to obey recommendations and instructions from the researcher in her previous role) it was necessary to use a different person to carry out the recruitment and intervention. The researcher recruited an environmental health practitioner who was newly qualified and had not yet begun to complete food inspections within the study area. His background was in business advice, so was highly skilled in garnering engagement from food businesses to participate in activities which could improve their businesses. This environmental health practitioner spoke to all the food businesses frequented by the children in the survey to identify which businesses might be interested in participating in the study. He was successful in recruiting over fifty percent of the businesses, however it was determined that the fast food

retailer to receive the intervention would be the one which was not a national chain and had been frequented by the most pupils in the study survey. Consent forms were signed by the fast food retailer before data gathering began. A copy of the form is provided in the appendices.

6. Footfall survey completed

A suitable location was identified outside the recruited fast food retailer where the entrance could be covertly observed. A footfall survey was completed before and after the intervention was implemented. The method for this is described in more detail below in the data collection section.

7. Food sample obtained

A food sample was obtained of the children's meal deal available within the fast food retailer before and after the intervention was implemented. The method of collection and analysis is described below in the data collection section.

8. Nutritional intervention delivered to fast food retailer

The nutritional intervention which was based on the guidance provided within the Takeaway Toolkit was provided to the study fast food retailer.

As discussed above the takeaway toolkit contains three recommendations; a)

Local authorities should work with fast food retailers to improve the healthiness of their food offered for sale b) Schools should introduce policies to reduce the amount of fast food available to children during school hours c) Regulatory and planning measures should be used to prevent the proliferation of fast food retailers in the food environment.

The advice within the Takeaway Toolkit has not been evaluated in any robust way since it was published in 2012, however it has been recommended by Public Health England within their most recent guidance document as a means to focus efforts within the environmental health and planning professions (2).

The intervention chosen from the toolkit for this thesis's study was designed through the completion of an audit of the fast food retailer. Recommendations for changes to the food within the premises were chosen by the Environmental Health Practitioner as appropriate from a list of options which included; choices for fats or oils, frying techniques, use of low fat dairy, salt and sugar reduction, portion sizes, healthier meal options, promotion of healthier eating, availability of low sugar drinks, and availability of water. The results of the audit and the recommendations made to the fast food retailer will be shown in the results chapter (table 4.4. p102).

9. Interview was carried out with the fast food retailer

Following the post-intervention data collection of the foot survey and the food sample a semi-structured one-to-one interview (as described above) was completed with the fast food retailer.

Data collection

A large amount of data was collected during the survey. Robust (and validated where possible) data collection tools were used and are described below.

Data collection tools

Health Related Behaviour Survey

The Schools Health Education Unit (SHEU) administered a health related survey to pupils in all participating schools in the UK. The questionnaire was first used in the UK in 1979 and has been in use since then. The survey was developed in consultation with teachers, health-care personnel, and others professionally concerned with the healthy development of young people. The survey has since been completed by over 1 million pupils.

In 2014 the Secondary School Head Teachers group in Plymouth decided they would like to participate in the survey. They commissioned SHEU to administer the survey in Plymouth. All schools in Plymouth were eligible to complete the survey which was accessed through an online portal. The survey (run on a biennial basis) provided data which was collated and used to provide a snap shot of life in Plymouth for the pupils who complete the survey. This data was available for use by researchers within the city and this survey was adapted for the purposes of the thesis study.

Study questionnaire

It was decided to repeat all the questions on food and physical activity behaviour from the existing Health Related Behaviour Survey within this study and with the children recruited as participants. This resulted in a 15 question survey on breakfast, lunch, food and water consumption, physical activity, opinions about fitness. The list of food premises in the study area was used to create the sixteenth

question which requested the pupils to identify from the list those premises they had purchased food from in the past month. A copy of the questionnaire is included as appendix 1 and the data provide by the survey questions is shown below in

Table 3.1

Table 3.1 *Data provided by survey questions completed by the school children.*

Question number	Type of data	Statistical Test	Categories
1 – How did you travel to school today?	Nominal	Fishers	By car, not by car
2 – Are you a boy or a girl	Nominal	Fishers	Boy, Girl
3 – How old are you	Interval	Unpaired t-test	10, 11
4 – What is your postcode	Nominal	Fishers	Various
5 - Which of the following best describes your ethnic background?	Nominal	Fishers	White, Not white
6 – Which adults do you live with	Nominal	Fishers	Mum and Dad, Other
7 – How many portions of fruit and vegetables did you eat yesterday	Interval	Mann-Whitney	More than 5, Less than 5
8 – What did you eat for lunch yesterday	Multi-Nominal	NA	
9 – Have you ever had free school meals?	Nominal	Fishers	No – never, Other answer

10 – did you eat or drink anything before school this morning	Nominal	Fishers	Yes, No
11 – What did you have for breakfast?	Multi-Nominal	NA	NA
12 – How many cups of water did you drink yesterday	Ordinal	Mann-Whitney	Adequate, Not Adequate
13 – Which of the following food premises have you eaten from in the last month?	Multi-Nominal	NA	NA
14 – How fit do you think you are	Nominal	Fishers	Fit or Very Fit, Unfit or V. Unfit
15 – How many times did you exercise hard enough to breathe more quickly last week?	Ordinal	Mann-Whitney	7 or more, 6 or less
16 – How much do you enjoy physical activity?	Nominal	Fishers	A lot, Not a lot

Takeaway Toolkit audit

The fast food retailer who was recruited into the study was audited by the Environmental Health Practitioner. Using an audit tool created from the 'takeaway toolkit' each of the nutritional interventions which were available were discussed with the retailer, these were;

- choice of fats and oils in the cooking process
- Frying technique
- Draining of fats
- Use of low fat dairy
- Salt and sugar reduction
- Reduced fat, sugar, salt dressings and sauces
- Low sodium salt
- Appropriate portion sizes
- Healthier meal options
- Promotion of healthier eating to customers
- Availability and placement of low sugar drinks (including water)
- Availability of bottled water

During the one-to-one session each of these issues was discussed systematically with the fast food retailer. The potential nutritional improvements were identified systematically. A list of potential improvements was then made available and

recommendations were made to the food retailer. This list and the audit tool are provided in the results chapter (table 4.4 p102).

Footfall survey

A suitable location in the street outside the fast food retailer was identified. This allowed the door to the fast food retailer to be covertly observed. A table was designed which allowed for the systematic recording of people entering the fast food retailer, this table is in appendix 3. The data were categorised as follows
 Table 3.2 *Showing the categories used to record footfall at the study premises*

Description of person	Assigned category
small child not wearing a uniform	under 5
small child wearing a uniform	primary school
child wearing the uniform of the local secondary school	secondary school
Any person wearing non-uniform clothes	an adult (this group could contain sixth formers and older adults)

Groups of people were recorded and the number of people within the group was also recorded.

This survey was completed at two time periods during the study; the first was before the intervention took place and the second was six months afterwards.

Food sample for nutritional analysis

A sample of the children's meal deal was purchased and tested by a Public Health Analyst. They produced a Certificate of Analysis or Examination carried out under the Food Safety (Sampling and Qualifications) (England) Regulations 2013 (96).

The children's meal deal was 'Cheesy Chips' with a drink, the drink options were a fruit juice based drink or a carbonated drink, options were displayed on a shelf in the drinks display. The sample was placed inside a sterile sample bag which was sealed. It was then transported in a temperature controlled sealed cool box to the laboratory. The laboratory then carried out the tests to assess the Category 1 and 2 nutrition labelling parameters as listed below in table 3.3.

Table 3.3 *Showing the parameters tested within the food sample*

Parameter tested	Test used
Energy value (kJ)	Calculated (Protein + Fat + Sugar + Carbohydrate)
Energy value (kcal)	As above
Total fat	Gas-liquid Chromatographic (GLC) method
Saturated fatty acids	Calculated from Total Fat result
Monounsaturated fatty acids	As above
Polyunsaturated fatty acids	As above
Trans Fatty Acids	As above
Carbohydrates (available)	Calculated from combined weights sample weight - (moisture + ash + fat + sugar + protein)
Total sugars	Extracted in dilute ethanol, inversion by the Luff Schoorl method
Sucrose	As above
Glucose	As above
Fructose	As above
Lactose	As above
Maltose	As above
Galactose	As above

Crude Protein (Nx6.25) (Dumas)	Calculated from nitrogen content which is determined using Dumas method
Total dietary fibre (AOAC)	McCleary Method
Salt (via sodium x 2.5) 0.63 g/100 g	Atomic absorption spectroscopy

Data analysis

Quantitative data

There were three types of quantitative data collected: Survey data, chemical results presented as amount per 100g from the food sample and frequency data from the footfall survey. These data are described in more detail below.

Survey Data

Data were exported as an excel spreadsheet using Microsoft Excel (2010); using an informal check for normality it was found the data had a normal distribution curve. Frequency counts of category answers for each survey question were created and converted to percentages.

Although there were 16 questions on the survey the only question of use to the thesis study was the final one which elucidated the fast food retailers pupils were frequenting. The survey produced some interesting data on food and physical activity behaviour however due to the delays with the school completing the survey with the Year 6 school pupils; data was not available until April 2017. This delayed the delivery of the intervention so that it was impossible to carry out the post

intervention follow up survey as the Year 6 pupils had all moved on to Secondary School by the time the follow-up survey was due to be carried out. The original intention had been to compare the survey results for each child before and after the intervention. The loss of this aspect of the survey was disappointing however it was a useful lesson in the implications of working with schools on data collection. Delays are common due to the pressure schools are under to meet teaching objectives. The survey itself was designed to give an opportunity for practicing of mouse control on a computer, a skill which is in decline due to the use of touch screens. Once the follow-up survey data was impossible to collect the original survey data became of less relevance to the intervention within the fast food retailer. A decision was therefore made to not complete the data analysis as originally designed in the study and the results of the survey are included as an appendix, and the data from these questions is therefore reported but not analysed except to identify the demographic characteristics of the pupils in comparison to the city's responses to the same questions.

Food sample

The laboratory results were provided as a numerical measurement per 100g for calorie content, protein, carbohydrate, fibre, fat and saturated fat. The measurement was converted using the Food Standard Agency's nutritional guidelines which categorises food as red for high, orange for medium and green for low amounts of fat, saturated fat, sugars and salt. The more green on the label, the healthier the choice. This is referred to as the Food Standards Agency 'traffic lights' (97). Differences were calculated between the two samples. It was assumed a

reduction in calorie, sugar, fat, saturated fat or salt content was an improvement. An increase in fibre content was assumed to be an improvement. Each nutrient tested was assessed in this manner. Improvements were calculated between the before and after results. A two-tailed t-test was carried out using SPSS to assess whether the change was statistically significant. This test was chosen because the data collected were repeated ratio data with a normal distribution.

Footfall survey

Numbers and types of customers entering the hot food takeaway in the after school period were recorded numerically between 3 and 4pm for two weeks. This provided ratio data. The results of this survey were collated using descriptive statistics. The mean, mode and median were calculated for each ten minute period. A comparison between the numbers and pattern of the results of the survey pre and post intervention was carried out using Excel.

Qualitative data analysis

One-to-one interview

The interview was transcribed using Express Scribe transcription software; in addition hand written contemporaneous notes were added to the transcription. Thematic analysis looks for themes and categories within the data collected (88) . It seeks to summarise the meaning of the data collected so that it can be reported to an audience. This was an appropriate approach to the analysis of qualitative data in this study. To categorise and understand the themes within the transcribed interview it was necessary to group the fast food retailer's comments into themes.

It was expected from the 'professionals' research paper (74) that financial and time constraints would be mentioned within the interview. It was also expected that concerns about customer preferences impacting on profit would be found within the transcript.

The transcript was read through several times and was then separated into smaller phrases which expressed one idea alone. The 'ideas' were written onto sticky notes and placed on a board. Each 'idea' was then compared to the other ideas. Similar ideas were grouped together. Once each 'idea' had been placed in a group these groups were given a descriptive category name for example 'money' or 'time'. These headings were used as the codes from the text. This method is referred to as inductive analysis and is recognised as a robust qualitative research method, Braun and Clarke give an excellent outline of its use in their paper *Using Thematic Analysis in Psychology* (98).

There are drawbacks with this type of analysis. Categorisation can be a subjective process, it was therefore necessary to include review by other researchers in the process. This review process was carried out by the study supervisors and resulted in rigour amongst the categories which had been freely found within the text, with each category being challenged and defended at this stage of the process. Full saturation was required to ensure the categories within the text had been fully found and grouped in order to find the main category from the text. It was also important to maintain the richness of the original text. The results of this analysis are given in the next chapter.

Ethics

Ethical approval

Ethical Approval was sought and granted by University of Plymouth Research Ethics Committee, Faculty of Health & Human Sciences and Peninsula Schools of Medicine & Dentistry in October 2016. This was following the submission of an application form and supporting documents. The ethical implications of the study are described below.

A number of ethical issues were raised by the study. It was necessary to ensure participants (school pupils and the fast food retailer) were able to give fully informed consent. Some of the participants were potentially vulnerable, being children, and therefore consideration had to be given to how they would understand the study's purpose. All of the study participant's right to withdraw, confidentiality, anonymity and protection from harm were also considered.

Informed consent (pupils)

A letter was sent home to the parents of Year 6 pupils asking if they were willing for their child to participate in the survey as part of the study. Year 6 pupils were chosen because they are the oldest year in Primary School and would therefore have the highest literacy skills. This would make them more likely to understand and answer the questions in the survey. They were asked to complete a signed consent form and return it to the school. The form teacher collected these consent forms. The pupils were then asked to complete their own consent form opting in to the study. Information about what would happen with the data they provided and

what support they could expect if they experienced any unpleasant feelings as a result of the survey were explained in an accompanying letter. The survey was completed on a computer during a computer lesson. The use of the survey during this lesson was designed to coincide with learning outcomes around practicing the use of a mouse and completing online questionnaires. Participation was voluntary, and pupils were offered alternative computer based activities if they wished to refuse to participate.

Informed consent (fast food retailer)

A document outlining the potential benefits and disadvantages to the fast food retailer of participating in the study was produced and given to the retailer before they were asked to participate. They were given a week to consider whether they wanted to participate after which they were asked to sign a consent form. This process was undertaken by the EHP who was to complete the intervention. It was ensured there was no previous relationship between the EHP and the business to reduce the potential for coercion.

Openness and honesty

Contact details for the lead investigator were made available to all participants so that in the event of any query they could be answered. The school pupil's teacher was also in contact with the researcher by email throughout the study.

Right to withdraw

Study subjects were informed of their right to withdraw at any point during the study. The data they had provided up until that point would be destroyed and would

not be included in the study. Pupils would have been allowed to carry out other work if they decided to withdraw. The fast food retailer's right to withdraw at any time without any negative consequences was emphasised.

Protection from harm (school pupils)

There was a small possibility the questions asked in the survey would have a negative impact on the children involved, a safeguarding policy was therefore put in place with children being advised they could speak to their teacher if they became upset during the survey. The questions related to eating habits and physical activity level so it was hoped most children would not find these questions upsetting.

Protection from harm (fast food retailer)

It was understood the fast food retailer recruited into the study could have been harmed if his business was financially undermined or negatively impacted by the changes requested during the intervention, for example if they had less customers because of the nutritional changes. This was fully explored with the owner before he signed a consent form to participate.

Confidentiality and anonymity

Data were kept confidential through the use of encrypted PCs and paperwork associated with the study was kept securely. The anonymity of all study participants was maintained throughout the study and where necessary a pseudonym was used for the fast food retailer throughout the study to protect the identity of the retailer involved.

Reliability and validity

The study was designed to ensure reliability and validity however there are potential sources of bias within the methods chosen; these have been discussed in the statements above. It was necessary to be aware of the limitations of the study and these will be expanded upon in the discussion chapter.

The next chapter will report the results collected during this study.

Chapter 4 : Results

Five sets of data were collected during this study these are listed below in the order in which their collection was described in the methods chapter:

1. Health related behaviour survey (HRBS) and study online survey

The year 6 class at the study school had 24 pupils in it. The 16-question survey was completed by all 24 pupils however, as discussed in the methods chapter, the only question of interest to the thesis study was the final question on fast food consumption by the pupils. This was the question which allowed for the identification of a suitable fast food retailer to work with during the study. Although the data produced by the other fifteen questions was interesting it was of little relevance to the thesis study and therefore has been included in Appendix 5 but only the first five questions which identified demographic data will be reported in the results chapter, the rest will be reported in the appendices. This is to prevent confusion over the purpose of the study which is to understand the impact of a takeaway toolkit based intervention on a fast food retailer.

2. Takeaway toolkit audit results (food served within the FFR)

A list of foods and cooking/preparation techniques were collected. A record of advice given during the intervention will be presented.

3. Footfall survey

Count and categorisation of people entering the study fast food retailer before and after the intervention will be presented.

4. Food sample

Laboratory results for the two food samples will be presented.

5. Interview with FFR

The thematic analysis of the semi-structured interview to gather the fast food retailer's thoughts and experience of participating in the intervention will be presented.

1. Health related behaviour survey (HRBS) and study questionnaire

Demographics

The questionnaire was completed by n=24; 66% were girls, 75% were 11 year olds the rest were 10 years old. Seventy nine percent of the pupils were from a White British ethnic group, three pupils did not report their ethnicity. Sixty two point five percent of the pupils lived with both their Mum and Dad, 21% shared time between their Mum and Dad and 12.5% lived with only their Mum. The comparison between this data and the city's dataset is presented in Table 4.1.

Table 4.1 *Shows the comparison between characteristics of the study group and those for the city*

Demographic factor	Category	Study Group Mean n = 24 (%)	Health Related Behaviour Survey* Plymouth Mean n = 1500 (%)	Variance between the two groups %
Gender	Female	16 (66)	50.1	15.9

	Male	33	49.8	-16.8
Age	11 year olds	75	37	33
	10 year olds	25	37	-12
Ethnicity	White British	79	87	8
	Mixed White and Black African	4	0.3	-3.7
	Other White	4	2.5	-1.5
	Don't want to say	12.5	2.4	-10.1
Who they live with	Mum & Dad together	62.5	65	2.5
	Mum & Dad shared	21	7.25	13.75
	Mainly or only Mum	12.5	14.5	2.5
	No answer given	4	0.5	3.5
Eligible for Free School Lunch	No	45	60	15
	Yes	29	11	-16
	In the past	8.5	12.5	4
	No answer	16	1.8	-14.2

*Plymouth results taken from the Health Related Behaviour Survey 2015-16

It can be seen that the demographics of the surveyed group differed from the city average for this age group in some ways. There was a larger representation of female responders than the city average. The group also had a lower percentage of pupils who lived with both parents together and a higher percentage who shared time between their two parents.

Thirty five point five percent of the pupils in the study group were or had been eligible for free school meals at some point; this was higher when compared to the city average of 23.5% and this is an indication the group were from a lower socioeconomic group than the city average.

The consumption of fast food from premises surrounding the school

Pupils were asked to indicate from a list of 14 food premises which ones they had visited during the previous month, the answers to this question are shown in table 4.2 below. During the survey period there were 74 unique pupil visits to food retailers (multiple visits to the same retailer were not recorded) by the 24 pupils. The number of pupils who visited each premises is listed below.

Table 4.2 *Pupil's response to the questions "which of the following food premises have you bought food from in the past four weeks?"*

Food Premises	Number of pupils who reported visiting premises (max=24)
KFC (national chain shop)	22
The Chippy/Lees (fish and chip shop)	9
Dominos (pizza shop)	8
Pizza hut (pizza shop)	8
Warrens (corner shop)	7
St Budeaux News (corner shop)	5

Devon Pies and Pasties (butchers selling hot pasties)	4
Ivor Dewdney (hot pasty shop)	3
Plymouth Food and Wine (corner shop)	3
China Valley (Chinese takeaway)	2
Square Café (sit down café – does takeaway)	1
Total	74

All pupils reported making at least one visit to a food retailer in the previous month.

Only eight pupils had made one visit or less. This final question response supported the selection of the fast food retailer for the intervention.

2. Food served in fast food restaurants

The following data relates to the fast food retailer. During the one-to-one session completed by the environmental health practitioner and the fast food retailer a full list of the menu available in the restaurant was collected and is shown in table 4.3 below. Following the qualitative interview with the fast food retailer the changes reported to have been made by the food retailer following the intervention were recorded and are shown in 4.5 .

Table 4.3 *Showing menu in study restaurant*

Menu Item	
Chips	Curry sauce
Deep fried fish (Cod, Haddock, Plaice)	Mushy peas
Deep fried chicken pieces	Curried chicken
Processed fish pieces	Baked beans
Sausages, Battered sausages Saveloy sausages	Selection of drinks Slush puppies Sodas Fruit squashes
Grated cheese	Gravy

Table 4.4 *Showing food preparation methods within the study premises*

Food item	Preparation method	Potential improvement discussed	Implications of change discussed
Deep fried items	Choice of fats and oils: Beef Fat, separate fryer for chicken strips	Could choose a polyunsaturated oil such as vegetable	Increased cost Taste of fried items could be impacted
	Frying Technique Fry at 175% Blanch 5min30secs Cook 4m30secs	This is a good technique for minimising fat absorption in fried items	NA
	Draining of fats Blanch up to 8 ½ baskets in advance	Bang the basket and then shake to remove excess fat	No particular implications
Cheese	Use of low fat dairy: Full fat cheese is used in the meal deal	Investigate lower fat cheese alternative	Increased cost Taste of cheese may have implication for customer

Drinks	Sugar and Salt reduction: Children's drinks: Slush puppy Fruit shoots Water is available Diet Coke is available	Placement of low sugar, water options in a more prominent place in fridge to encourage children to choose them.	No cost implications Space/placement may have implications for other item's sales.
Salt	Low sodium salt: Normal salt is provided currently	Could look at low sodium salt to provide	Cost implication Taste implication
Portion size	Appropriate portion sizes: Portion size determined by packaging	Investigate measuring portions using equipment i.e. pre-weighed grated cheese portions stored in fridge rather than using hand to fill box	Cost implication – could be positive or negative Customer satisfaction could be impacted.
Children's meal deal	Healthier meal options: Children are offered cod bites, small chips,	Could investigate more vegetable options with meal deals.	Cost implications Taste/Waste implications

	beans, cheese, gravy and a drink Adults are offered chicken curry, chicken fillets seasoned		
Healthy items	Promotion of healthier eating to customers: Do not currently do this	Could consider emphasising healthy options through the menu display	Potential cost implication

Table 4.5 *Showing the changes made in the fast food restaurant following the intervention.*

Food item	Change confirmed
Choice of fats and oils: Beef Fat, separate fryer for chicken strips	<ul style="list-style-type: none"> No change
Frying Technique Fry at 175% Blanch 5min30secs Cook 4m30secs	<ul style="list-style-type: none"> No change
Draining of fats	<ul style="list-style-type: none"> No change

Blanch up to 8 ½ baskets in advance	
ADDITIONAL CHANGE	<ul style="list-style-type: none"> • Extra filtering of oil, twice daily using new machine (The Merlin) • Changing of oil every two days.
Use of low fat dairy: Full fat cheese is used in the meal deal	<ul style="list-style-type: none"> • Investigated – customers did not like taste/texture so reverted to original
Sugar and Salt reduction: Children's drinks: Slush puppy Fruit shoots Water is available Diet Coke is available	<ul style="list-style-type: none"> • Water added as option to children's meal deal • Salt shaker with reduced number of holes now used
Low sodium salt: Normal salt is provided currently	<ul style="list-style-type: none"> • No change
Appropriate portion sizes: Portion size determined by packaging	<ul style="list-style-type: none"> • Reduced portion sizes for chips • Measured portion sizes for cheese small, medium and large
Healthier meal options:	<ul style="list-style-type: none"> • Children's portion size reduced

Children are offered cod bites, small chips, beans, cheese, gravy and a drink Adults are offered chicken curry, chicken fillets seasoned	<ul style="list-style-type: none"> Adults – fresh chicken in curry
Promotion of healthier eating to customers: Do not currently do this	<ul style="list-style-type: none"> No change

Fast Food Meal Deal Sample

As reported in Table 4.5 p104 above, following the intervention the fast food retailer had made several changes based on the recommendations made at the initial one-to-one coaching session these were;

- Decreased the portion size of the children's meal deal from 124g to 75g
- Reduced and standardized the amount of grated cheese added as standard to the portion of chips. This was done through using a measuring utensil
- Salt was made optional by allowing customers to add their own salt after service
- They had replaced the 17-hole shakers with 5-hole shakers (which reduces the amount of salt released during a shake).
- Bottled water was added as an option with the children's meal deal

A sample of the children's meal deal was purchased and analysed prior to the intervention. The meal deal was a portion of cheesy chips with a small soft drink; a second sample was purchased nine months after the intervention.

When comparing the first sample with the second there were four nutrients which became less healthy

- calorie content,
- total fat,
- saturated fat
- trans fat

There were four nutrients which became healthier;

- sugar content reduced,
- protein content reduced,
- dietary fibre increased
- salt content (calculated from sodium) decreased

The laboratory results for each food sample are shown below in tables 4.6 and 4.7.

The differences between the two samples are shown in table 4.8.

Table 4.6 *Laboratory results for food sample 1*

Nutrient	Measurement – cheesy chips	Measurement – soft drink(sample 1 fruit juice)	Unit
Energy value (kJ)	925	50	kJ/100g
Energy value (kcal)	221	12	Kcal/100g
Total Fat	10.8	0	g/100g
Saturated Fat	5.97	0	g/100g
Trans Fat	0.29	0	g/100g
Carbohydrates	24.30	2.7	g/100g
Total Sugars	0.3	2.7	g/100g
Crude Protein	5.6	0	g/100g
Total dietary fibre	2.1	0	g/100g
Salt (Sodium x 2.5)	0.63	0.003	g/100g

Table 4.7 *Laboratory results for food sample 2*

Nutrient	Measurement – cheesy chips	Measurement – soft drink (water)	Unit
Energy value (kJ)	1143	0	kJ/100g
Energy value (kcal)	273	0	Kcal/100g
Total Fat	13.4	0	g/100g
Saturated Fat	7.18	0	g/100g
Trans Fat	0.36	0	g/100g
Carbohydrates	31.10	0	g/100g
Total Sugars	0.2	0	g/100g
Crude Protein	5.4	0	g/100g
Total dietary fibre	3.3	0	g/100g
Salt (Sodium x 2.5)	0.48	0.02	g/100g

Table 4.8 *Showing comparison between the two samples*

Nutrient test	Sample 1 124g per portion	Sample 2 75g per portion	Difference
Energy value (kJ)	1147	860	287 – reduction
Energy value (kcal)	274	204	70 – reduction
Total Fat	13,4	10	3.4 – reduction
Saturated Fat	7.4	5.4	2.0 – reduction
Trans Fat	0.36	0.27	0.09 – reduction
Carbohydrates	30.1	23	7.1 – increase
Total Sugars	0.4	0.15	0.25 – reduction
Crude Protein	6.9	4.0	2.9 – increase
Total dietary fibre	2.6	2.5	0.1 – increase
Salt (Sodium x 2.5)	0.78	0.36	0.42 - reduction

Results showed there was a difference between the first sample (Mean = 160 SD= 358) and the second sample (Mean = 110 SD = 271) however a paired t-test showed this difference was not statistically significant $t(9) = 1.674, p < 0.13$.

3. Footfall Survey

There were two periods of data collection in the study area; May 23rd – 28th 2017 and February 15th – 22nd 2018. The data collection identified people entering the study fast food retailer and whether they were alone or in a group. The data contained adults and children and categorised them based on what they were wearing (i.e. school uniform or not).

During the first survey period before the intervention was implemented (May 23rd – 28th 2017) four days of data were collected on the Monday, Tuesday, Thursday, and Friday. No data were collected on the Wednesday evening of the first survey period. A total of 88 adults and children were observed entering the fast food takeaway between 3 – 4pm, this ranged from 11 visits on the Wednesday evening to 35 visits on the Monday evening. There were 16 groups who entered the fast food takeaway, this ranged from five family groups to eleven secondary school pupil groups. The smallest group was two people; the largest group was nine people. The most frequent group size was two people.

During the second survey period (February 15th – 22nd 2018) five days of data were collected on Monday, Tuesday, Wednesday, Thursday, and Friday. A total of 102 people were observed entering the fast food takeaway between 3 – 4pm, this ranged from 16 visits on the Thursday evening to 25 visits on the Friday evening.

During the first survey week 53 people entered the premises within the twenty minute time period between 15:10 and 15:30 that is; immediately after the end of the school day. This was an average of 13.25 people per day.

During the second survey week 66 people entered the premises within the twenty minute time period between 15:10 and 15:30. This was an average of 13.2 per day.

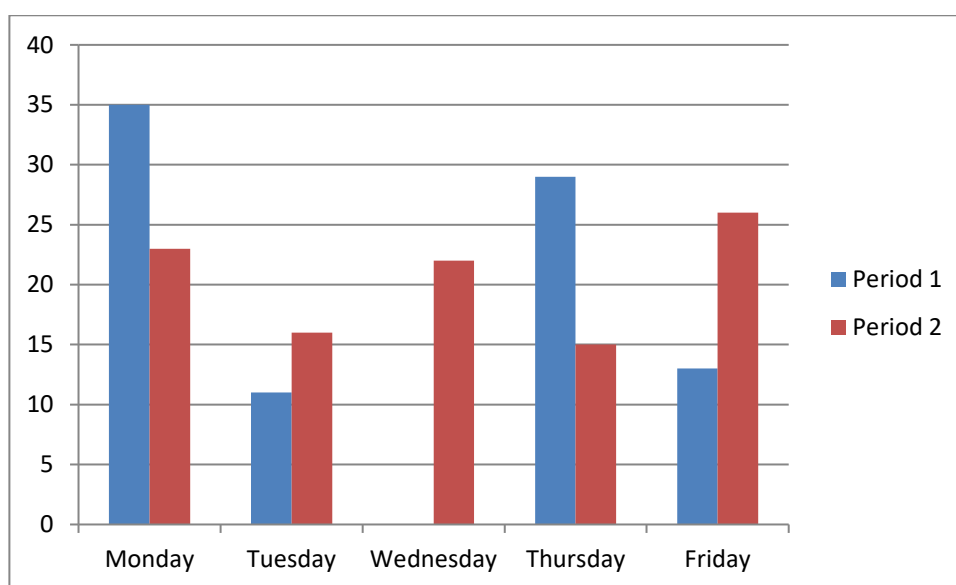


Figure 4.1 *Column graph showing total number of visits to the study fast food takeaway during both survey periods*

Breakdown of shop users

During the first survey period three **primary school** children visited the shop; two went in alone, unaccompanied by either friends or family, one primary school child went in accompanied by their parent/carer.

During the second survey period five **primary school** children visited the shop;

During the first survey period 53 **secondary school** pupils entered the shop. This compared to 74 during the second survey period.

During the first survey period 1 **child aged under five** entered the fast food takeaway accompanied by a parent/carer. This was the same during the second survey period when one child under 5 entered the takeaway with their parent/carer.

During the first survey period of the 88 people who entered the fast food takeaway 31 were **adults**. This compared to the second survey period when 22 of the 102 people who entered the shop were adults.

This data is shown in the graphs below.

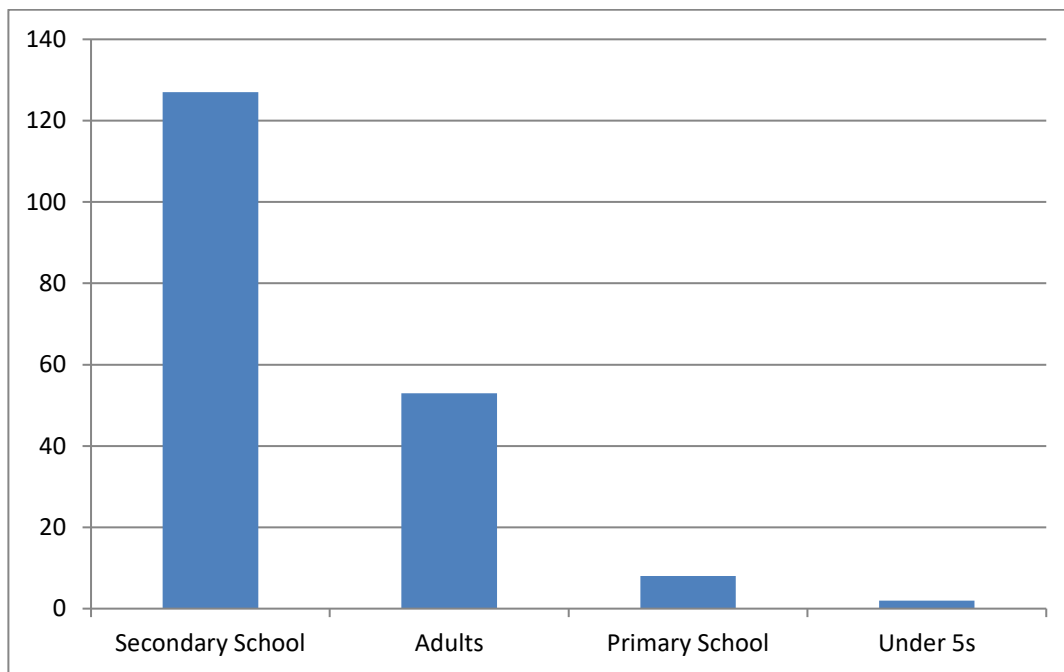


Figure 4.2 *Total numbers of people entering fast food retailer during survey periods*
23rd – 29th June 2017 and February 15th – 22nd 2018

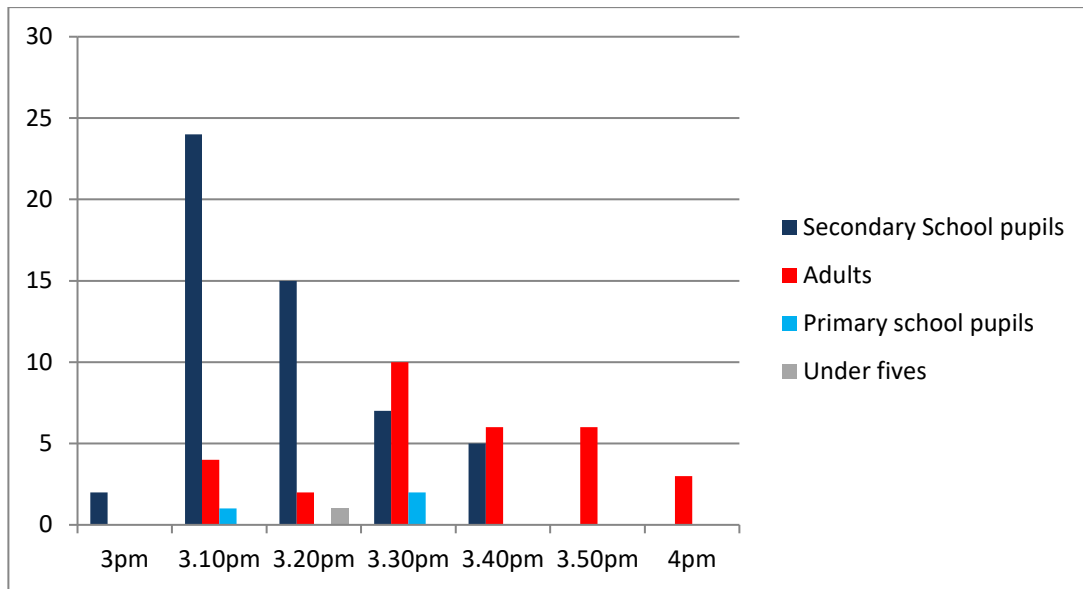


Figure 4.3 Showing peak times for each category of customer in the fast food takeaway during survey period 1

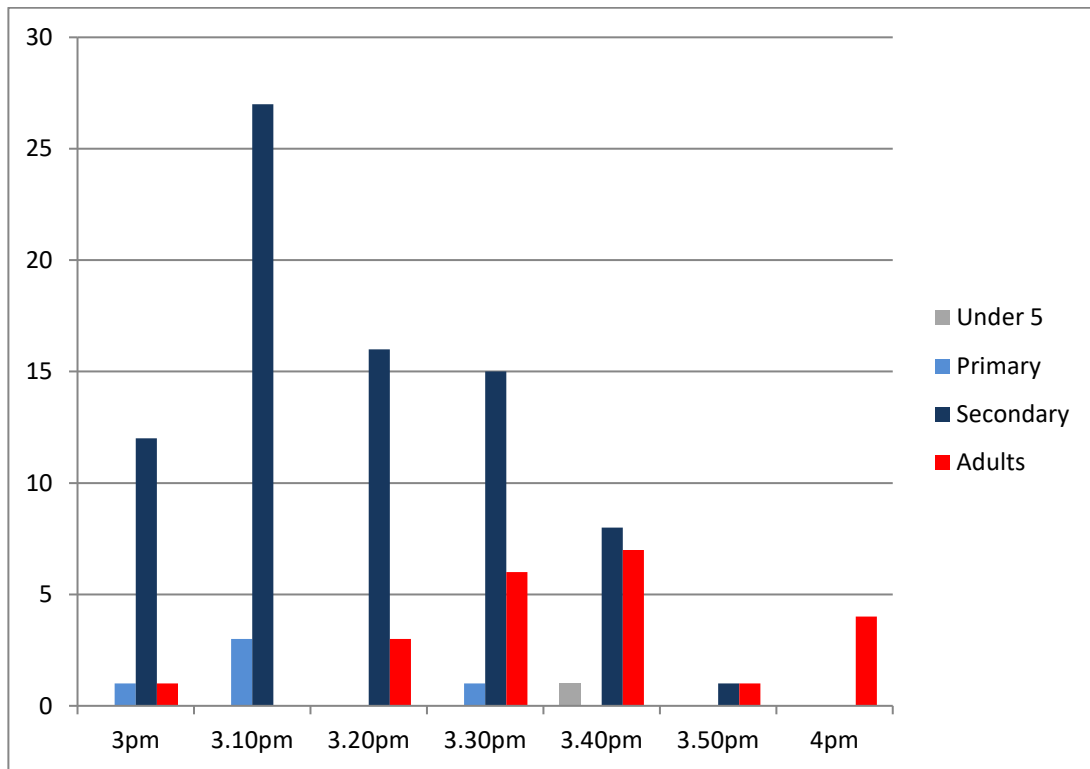


Figure 4.4 Showing peak times for each category of customer in the fast food takeaway during survey peak period 2

4. Fast food retailer interview

Interview themes

The interview confirmed the nutritional changes made by the fast food outlet following the one-to-one training session delivered by the environmental health practitioner; these are listed in Table 4.5 p 104. Throughout the interview it was noted that the food retailer had put a lot of time and energy into investigating which of the intervention's suggested changes would be best for his business. He was very open about the implications of the proposed changes on his business and referred to a number of influences on his decision making process which have been organised into themes and sub themes as listed in the Table 4.9.9.

Table 4.9 *Showing themes within qualitative interview with fast food retailer*

Theme	Sub themes
Customer preference	Customer happiness Customer preference Customer experience Customer choice Taste (Quality) Healthy choices
Cost/Revenue/Profit	Cost Revenue Profit Competition

	Portion size
--	--------------

Customer preference/happiness

The most important factor which influenced the food sold, reported by the retailer, was customer preference or happiness; this included customer's preferences specifically with regard to taste (which included quality). There were multiple scenarios' described by the retailer, where customer's taste and preferences were prioritised over other consideration. With regard to changes he had made which had not lasted he said;

"We have tried changing it in the past but it wasn't the same taste, and it's what customers preferred."

"We tried a different cheese that was lower fat...but it was pre-grated and when you opened it, it had this powder caked on it and when you added the gravy it didn't melt, so people wasn't really happy with that, so we went back to what we originally had."

The only consideration which appeared to be more important to the fast food retailer than customer experience was the need to remain profitable. *"It's about keeping customers happy as well as keeping our revenue up"*.

The retailer was willing to consult his customers on what they preferred, for example with regard to the recommendation to move from beef fat to vegetable oil for frying *"We put out a survey of what they preferred and that's what came back – I'd say 70% preferred beef fat."*

The retailer had tried all of the recommendations made during the intervention, however some were unpopular with customers and he described how they had therefore reverted to the original food process.

The retailer was proud of their reputation amongst customers saying *“People used to come to us cos we was a cheap shop. Now it’s more about the quality definitely.”*

Healthy choices vs customer preference

The retailer had added water as an option on the children’s meals, with regard to providing healthier choices for children but he didn’t believe children would voluntarily choose the healthier options. *“There is different things we could put on the menu, but will children go for it? If they’re pushed by their parent’s maybe.”*

However as he acknowledged *“Do most of the kids who come in (the shop) have parents with them? No, schoolchildren? No. It’s straight from school straight in the shop.”*

For adults there were also some healthier options available at this retail outlet.

Cost/revenue/profit

Cost, revenue and profit were all factors which were fundamental to the business according to the FFR.

Decisions about whether to change to a vegetable fat for cooking the chips were strongly influenced by cost. *“The main thing we spoke about was the beef fat, changing it to vegetable oil. But that was one thing we couldn’t do cos it’s just not cost effective, it’s too expensive.”* Added to the comments regarding customer

preference around beef fat vs vegetable fat this was one change that was not going to be explored any further.

The retailer mentioned profit and revenue several times in relation to whether he was willing to make changes to the food he sold. *"You can put things in place but at the end of the day it's about getting your sales and it's about profit. That's what this game's about I think."*

Competition

Other fast food retailers were important when the retailer decided what to do with his business. When describing the changes within his business over the past two years the retailer spoke about quality and competition. *"I think people used to come to us cos we was a cheap shop, we really are and I think it was more about the cost for people than what the quality of the food was. Now it's more about quality definitely, the guy who owns the shop he also owns a food supply company so he can get away with less (lower) prices."*

However competition between shops determined a lot within the business. *"I think it's a lot of competition within chip shops; everyone kind of puts on the same menu. Near enough the same thing."*

The differences between the fast food retailer's outlet and others were mentioned frequently. *"It's just the quality of oil is much better you know. We change our oil every two days which is massive for a chip shop. There are chip shops out there that don't do it all week.* In addition the differences in quality (not necessarily the healthiness) of food provided by the retailer *"There are different things on the menu*

like the chicken curry is fresh chicken. None of our chicken is frozen bought in; it's cooked in the shop."

Portion size

One of the changes which the retailer had adopted was to reduce the portion size for children's small chips and cheese, through the use of polystyrene boxes which assisted portion control. *"Small cheesy chips it is, one of the main thing that the kids go for"*. He referred to the actions he had taken and that this was the most notable thing which had occurred. *"Before they were probably getting one and a half portions to what they get now. And it's still the same price, so that was probably one of the biggest things people picked up on, but you know its 99p not £4. And that's only children's so you know."* Regarding the size of the new portions, this was determined by the new serving trays *"HB7 it is now, which is the smallest you can get, can't get no smaller."* A HB7 has a volume of 75cm² which allows for a capacity of approximately 75g whereas their original box used before the intervention was a HB9 which has a volume of 123cm² giving a capacity of approximately 123g this is a reduction to 60% of the original portion size.

The implementation of new portion sizes had presented some teething troubles but they had now been resolved; changes had required a short retraining for staff and then maintenance by the retailer. *"We've got portion pots for our small, medium and large chips whereas before it was just chuck a handful on...of course at the beginning it was all about portion control all the right measurements and weights going out. With regard to what the issues at the beginning had been "...it's over-portioning, you can't say anything when they hand it over to the customer but take*

them aside after.” The retailer reported in the interview that these issues had only occurred at the beginning of the change and now there were no issues.

An additional change which had been unnoticed by customers was moving from salt cellars with 17 holes to those with 5. *“We spoke about less holes in the salt shaker so it doesn’t give as many...we did that”.*

The interview with the fast food retailer illuminated the barriers to change he had encountered whilst adopting the takeaway toolkit recommendations and gave a useful insight into his experiences.

The next chapter will discuss the implications of these findings within the wider context of the research area.

Chapter 5 : Discussion

The findings of this study presented in the previous chapter showed the chosen intervention in the food environment was successfully and fully applied within the fast food retailer. A range of data was collected in order to determine the impact of the intervention.

- **Health related behaviour survey (HRBS) and study online survey**
- **Takeaway toolkit audit results (food served within the FFR)**
- **Footfall survey**
- **Food sample**
- **Interview with FFR**

The aim of this study was to investigate the use of the takeaway toolkit as a mechanism for improving the nutritional content of food served in fast food retailers. In answer to the research question posed at the beginning of this study *“What is the impact on a fast food retailer of an intervention based on the takeaway toolkit?”*

Drawing the data and information described in the results chapter together it allows for an understanding of the impact of the intervention on the research premises, and as will be discussed below the study results show that it is possible for a fast food retailer to make some changes to the nutritional content of the food they sell, without undermining the economic viability of their business. To take an ecological

framework approach to discussing the results found in this study the following diagram Figure 5.1 describes the results as a whole.

1. The study online survey with pupils

The purpose of the pupil survey was 1) to identify a fast food retailer for the study 2) to allow comparisons to an existing data set for the city and to draw conclusions about the comparison of the study pupil group to the city population. As was shown in the previous chapter the results gathered showed the study pupils (n=24) differed from the city population's averages on the following demographic factors; there were more females in the study pupil group (60% F, 40% M), there was a more diverse ethnic mix amongst the study pupils, there were more pupils who split their home life between their mother and father who lived separately, there were also higher numbers who were or had been eligible for free school meals.

These results when combined indicate the group displayed characteristics associated with lower socio economic status; many research papers on obesity have identified a link between socio economic status and obesity status (1, 3, 5, 30) and there is substantial evidence to indicate that it is the lower socio economic group who are at greater risk of health impacts related to obesity (99). The setting of this study within the deprived ward was useful as the systematic review showed strong evidence that there are more fast food retailers located in deprived wards, and the pupils in the study population were therefore more likely to be exposed to more fast food retailers than pupils from a less deprived ward. Due to the size of the survey in the thesis study it did not look specifically at any differences between

deprived and less deprived wards but the findings in this study should be of interest to other researchers studying food environments in deprived wards.

Health inequalities research strongly indicates there are differences between socioeconomic groups (100). This difference is a fundamental tenet of the Marmot principles, what Marmot and Richardson refer to as the social gradient they argue appears to exist in every human sphere (100) the results of the systematic review found evidence for this social gradient in food availability. In published research which investigated the relationship between geographical location and fast food provision, green grocers and supermarkets it was found that there were differences between provision of food in lower and higher socioeconomic areas (51). Although this was not a focus for the study in this thesis it is interesting to note that within a focused issue such as fast food retailing this social gradient still appears to be present (51). The impact of these additional fast food retailers within the more deprived neighbourhoods is still to be quantified.

2, 3, 4 The main findings relating to the fast food retailer

2. The footfall survey

It was interesting to note there were primary school pupils who entered the study fast food retailer both alone and accompanied by adults during the footfall survey. The main finding of the footfall survey was that their customer base between 3.15 – 3.45pm on weekdays for the fast food retailer was mostly children from the local

secondary school, matching research by Caraher which has identified a similar pattern of consumption amongst children in London (75, 101). The retailer himself confirmed they sell between 40 – 50 portions of cheesy chips per day, mostly to this age group. Although smaller in numbers there were primary school pupils who entered the shop alone and purchased food, this was certainly contrary to the expectations of planning officers with whom the researcher had discussed fast food consumption by children at great length. These discussions with planning officers, who believed primary school children did not eat fast food unless fed it by their parents, was one of the reasons the researcher was interested in completing this thesis. Children entering fast food retailers unaccompanied by parents is not an unexpected result however it is useful to complete a study which records this activity in the food environment. The lack of parental supervision within the fast food retailer has implications for children's food related behaviour because according to Yee parents have an important role to play in influencing their child's food choices (102). If parents are not present at the point where children are making food choices they cannot have the same level of influence as when they are. For this reason it was important to complete the foot survey. Having evidence that primary school pupils enter the fast food retailer alone and unsupervised on their route home from school will be useful when determining what impact a new fast food retailer near a primary school could have on health.

The manager of the fast food retailer reported there had been no adverse impact on the profits within the premises of the changes he had made; in fact serving a smaller portion for the same price had allowed them to increase their revenue

whilst reducing overheads. There was no noticeable difference between the two footfall surveys so customer numbers did not appear to have been affected by the intervention. This is an important finding and will be expanded and discussed in more detail below.

The study business made a number of changes to the food they sold as a result of the intervention these were: reduced portion sizes, reduced salt use, introduced healthier options through adding the option of a bottle of water to the meal deal and introduced methods intended to make the beef fat used to fry chips as clean as possible (potentially reducing the acrylamide content of their foods – although this was not tested in the sample). The retailer did this with a high regard for customer experience and their explicit motivation was to avoid undermining their customer base as shown in the quotes from the qualitative interview. Where the retailer's customers objected to a change directly to him, the study retailer reverted to the original food preparation/ingredient. The only exception to this was the reduction in portion size which the retailer was committed to because it had beneficial financial implications relating to increased profits and reduced overheads; in that case the retailer drew customer's attention to the quality of the food they sold, which he believed compensated for the reduced portion size. The most significant finding in this study was the impact of the reduction in portion size which will be discussed further below.

3 and 4. The food sample and interview with fast food retailer

To summarise the findings from the food sample and interview see the ecological diagram below Figure 5.1 which shows the findings of the study split at the

following levels: individual, intrapersonal, organisational, community and systemic; by categorising in this way it allows for a visualisation of how the results of this study contribute towards the wider discussions ongoing about where intervention in the food environment will be most effective if real change is to be seen.

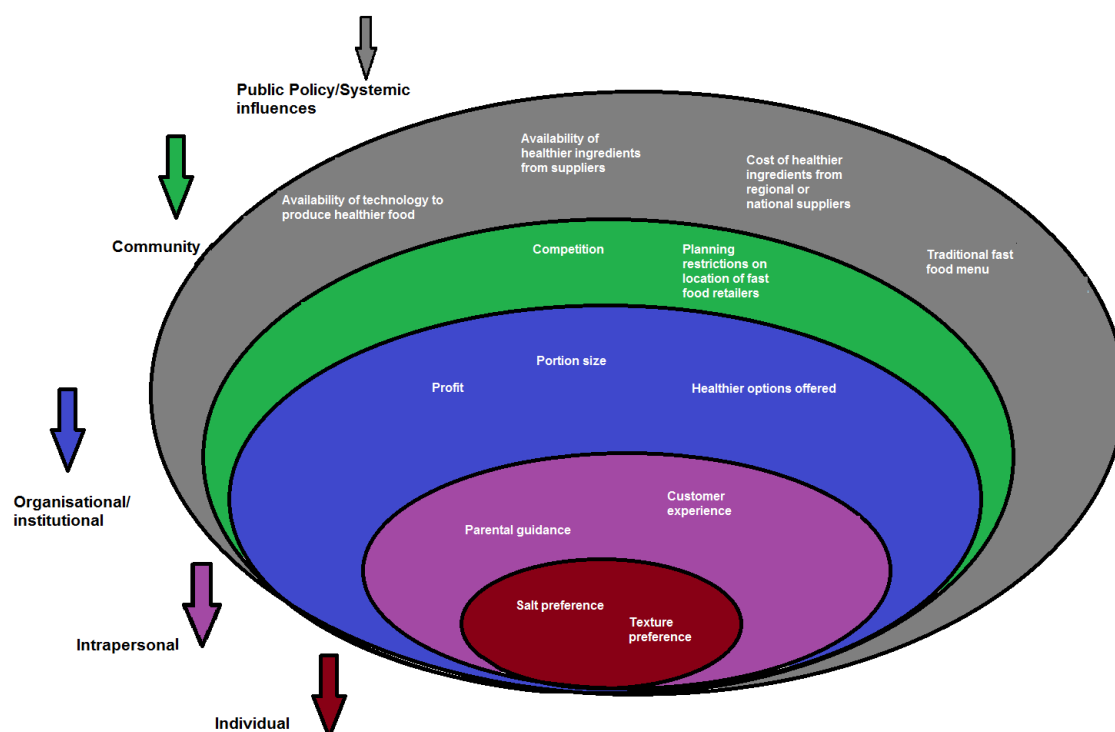


Figure 5.1 *Ecological diagram showing the results of the study*

Changes at the individual level

Salt preference

The salt content of the sampled food was found to have decreased slightly; this had not been noticed by customers. There is evidence from other studies including Goff and the report on the FSA salt reduction programme in the UK, where a

similar result was found. They demonstrated that ‘a series of small step reductions over time can limit rejection by consumers’ (125) and this supported Blais’s work on consumer palates which found consumer’s adapt to reduced salt in food over a period of approximately 8 weeks (126). These types of passive nutritional improvements (where the consumer is not aware of the change) are popular with retailers, and Wyness found the most common complaint a food business suffered as a result of salt reduction reformulation was an accusation of food being bland (125). There is substantial evidence to suggest the palate of UK consumers is gradually adapting to the sustained reduction in salt in processed food (125) and this has been modelled to result in a significant reduction in high blood pressure within the population of the UK (125) (127).

Texture preference

A customer survey carried out independently of this thesis by the manager of the fast food retailer identified beef fat as a preference over other fats.

There have been many marketing research studies into taste and customer preference, a database search of JSTOR on the topic gives over 3000 journal articles. During the interview the food retailer spoke about his belief (as a result of the customer survey he had carried out) that there was a customer preference for beef fat due to expected taste differences. It would be interesting to investigate further whether consumers can tell the difference between chips cooked in vegetable fat and those cooked in beef fat; Saguy and Dana did some work on this in 2003 identifying the health implications of customer’s sensory experience of deep fried food (133). It is possible food engineers, who can identify a cooking

vehicle which produces the same texture, taste and customer experience as deep fried beef fat would be a useful adjunct to this discussion, this lack of technology available on the market is listed on the ecological diagram as a systemic influence on the food environment. There has been some work done on air fryers, a technology which imitates deep fat frying with much lower use of oils or fats (134). Another systemic influence relating to this topic of customer texture preference is the technology currently available is prohibitively expensive and the research shows there is a substantial difference in texture between each technology which is yet to be found acceptable by customers (134). It is therefore recommended that an extension of this study could be to investigate customer taste preferences between healthier and unhealthy options with a blind tasting methodology.

Changes at the intrapersonal level

Customer experience

The manager of the study's retailer drew a distinction between the customer experience of adults and those of children; this was similar to the work of May on sugar reduction which found customer experience was of paramount importance to food retailers and manufacturers (108). Children's opinions were not regarded highly by the retailer and did not result in a change being reverted. This was an unusual finding as most research in this area has found customer opinion (regardless of age) was of paramount importance to retailers (34). It would be interesting to test this result in other retailers; it could be unique to the study retailer. Influences over children's choices of food within retailers are multi-faceted

and therefore are influenced in ways which are difficult to quantify. Story (110) gives a good description of the way teenagers are influenced to make food choices in her paper describing the social cognitive theory. In her conceptual framework paper on adolescent food choices; she describes the influences on a teenager choosing their lunch at school; she says they may be influenced by cost, taste, appearance of the food on offer, but also they could be influenced by what their friends have purchased or recommended, additionally what food is on offer (which is controlled by the canteen/school) and on top of this the types of foods advertised on TV which may also influence their purchasing decision. When we investigate food choice behaviours it is useful to keep in mind this ecological approach. Story identifies the period between 6 -14 years of age as the time a child moves from total dependence on their parents (being under their parents control) to autonomy (being able to make decisions alone) (110). This supports the findings in this thesis's study as through analysis of the footfall survey data children from the local secondary schools were found to be making autonomous decisions about purchases within the study retailer and lesser numbers of primary school children were seen to enter the fast food retailer alone. This finding has serious implications for our approach to obesity prevention. The ecological approach (where all factors influencing a food choice are considered) is certainly an appropriate approach to obesity prevention. Tim Lang, Professor of Food Policy at the Centre for Food Policy, City University London in his 2012 essay with Geof Rayner called the ecological approach to public health 'the way forward' for the 21st century (111). Obesity, as described in the Foresight review and discussed above in this thesis is

a complex system and the public health community needs to 'attack' multiple points simultaneously (112). As Story and Lang explain decisions are not made within a vacuum and children's food choices are influenced by many different factors (e.g. what is popular, what their friends are eating, what tastes good, what they can afford, what is advertised to them). The food environment within the thesis study is also complex and the intervention carried out and evaluated within this thesis influenced one very small aspect of this food environment. It is valuable to investigate and understand the impact of interventions like the takeaway toolkit on the food environment; however it is also important to maintain a perspective which acknowledges the whole system and the value of the ecological approach to influencing the obesogenic environment.

Parental guidance

Evidence shows given a choice children will choose to purchase the food which they find most pleasurable to eat (57, 59) with little regard for nutritional or health related factors. This is mirrored in the findings of this thesis as the retailer believed children would only purchase the healthier foods if their choice was influenced by a relevant adult. Most of his customer base is unaccompanied children and there is no opportunity for parents to influence the choice of food at the point of sale. The children's choices therefore rely on their own self-regulation strategies, as described by de Vet (18) in his paper which found those children with healthier self-regulation strategies were more able to resist unhealthy food choices.

Changes at the organisational level

Portion size

The most important and impactful change made by the retailer was the reduction in portion size. This was the change which resulted in a measureable improvement in the nutritional content of the children's meal deal as sampled after the intervention, simply through the mechanism of less food being served to each customer. Based on the retailer's conservative estimate of 40 sales of this item per day to children; this change potentially resulted in up to 40 children eating a third less calories from this snack.

The use of reduced portion sizes to influence health has been identified as the most effective method for reducing overall calorie consumption; as the MRC team at Cambridge found in their systematic review on portion sizes (109) so this research which supports the findings of the MRC is extremely useful. The impact of this reduction in portion size on the nutritional content of the children's meal deal was the main finding of the thesis study, other changes were identified in the second food sample but their potential impact on customers was relatively small and will be discussed further below.

The benefit of reducing portion sizes is that it is a very simple intervention, it does not require any new equipment or any change to cooking procedures. As the manager of the fast food retailer in the thesis study identified it required only that staff be trained to provide the smaller portion at the point of sale. Reducing the portion size has the knock on effect of reducing overheads as the cost to produce

the portion is reduced in correlation with the reduced size of the food being served, and this has an implication for profits within the retailer.

According to the manager of the study retailer the reduction in the portion size during the thesis study was noticed by customers however the fast food retailer had not experienced a drop in sales, this finding was reflected in the literature specifically Cohen's paper on automatic food behaviour which identified people would eat what they were served without thinking about the portion size or calorie content (17). It has to be acknowledged however that one of the potential impacts of reducing a portion size would be customer dissatisfaction, a review of obesity and portion sizes was completed by Ledikwe et al (113) which identified an alternative to reducing the size of portions and looked at reconstituting meals served in food retailers to contain less of the energy dense food items and more of the water rich items such as vegetables. They found this type of intervention could be successful if price and satiety provided by the portion was not affected. Although customers in the thesis study noticed the reduced portion size there was no report of customer dissatisfaction.

The acceptance of the new portion size in the study retailer could also have been influenced by the low retail value of the food changed; the retailer felt that for 99p the customer "didn't have much to complain about". Price has been identified as an important determining factor for food choices in adolescents by a range of researchers in the literature. Powell especially has published several papers relating to the relationship between price of fast food, vegetable consumption and

adolescent's obesity finding that with a reduction in the price of fast food there is an increase in BMI identifiable, and with an increase in the price of fast food; vegetable consumption increases. (35, 114-122). She identifies an important policy lever (the price of food) which could be used to influence the rate of consumption of fast food by adolescents. The use of taxes to penalise those purchasing 'unhealthy' foods will be discussed further below in the section on sugar, however it is interesting to note the findings in these papers which indicate a potential way forward for food environment interventions.

The thesis study results showed reduced portion size was successfully introduced and reinforced other work carried out by the Behaviour and Health Research Unit (BHRU) at the University of Cambridge on portion size (123, 124). Their systematic review on the topic concluded the reduction in portion size was the most powerful policy tool available for reducing individual energy intake (109). Providing smaller portions in the fast food retailer was a successful intervention as although customers did notice the difference they had continued to purchase the item and there had been no drop off in sales which undermined the retailer's efforts. Further research into customer experience may be able to identify more depth of information on this impact.

Healthier options offered

There was no indication that the introduction of a healthier option (provision of water with the meal deal) had an influence on customer choice. Further

investigation of the impact of this change would be required through monitoring of sales of water with the meal deal; this data was not collected in the thesis study. Within this small study the retailer found changes which had no noticeable impact on taste or texture were easier to implement, this reflected the findings on salt reduction as discussed above (125, 126), and other research by Goffe which showed retailers were concerned about the risk of diminishing their customer's experience (74, 128). According to the interview with the retailer in this thesis; the customer's experience was of paramount importance to the fast food retailer in determining the longevity of any changes to food provision. The retailer had no appetite for expensive low fat/low sugar/low salt ingredients because finances were very important to the fast food retailer. This indicates that if the alternatives were the same price or lower there would be an incentive for the retailer to use them. These results showing the retailers focus on money and customer experience are mirrored in the Hillier-Brown systematic review of interventions in specific food premises (73). Hillier-Brown categorised 34 interventions using the Nuffield Ladder of Hierarchy and found interventions most likely to be successful in promoting healthier ready-to-eat foods should restrict choice or guide through incentives/disincentives (129).

A review for the Medical Bulletin on obesity specifically outlined the need for what they called 'upstream' interventions which may affect a change in dietary intake at population level. It is these types of interventions they argued which had the most effective, cost effective impact on diet and consequently on diet related ill-health

(130). This was also supported by the recommendations made by Hillier-Brown in their systematic review on food environment interventions (73).

As can be seen through the combination of the results summarised and discussed above when critically analysed against the literature it is clear that it is possible for a fast food retailer to change their food to make it healthier without undermining the financial viability of their business. This supports the recommendations by PHE, CIEH and FSA to use the advice in the takeaway toolkit with food businesses and supports the need for further research to extend the sample size and identify whether the results from this small study are generalisable, repeatable or unique.

Profit

Profitability of the retailer's business was of paramount importance and therefore any of the changes recommended during the intervention could not have an impact on profit. The most successful intervention in the premises was the reduction of the cheesy chips portion size included in the children's meal deal. It was assumed the customer would be unhappy with a reduced portion size, this proved to not be the case as discussed above. The secondary impact of the reduced portion size was on the cost of producing a portion. This allowed the retailer to increase their profit on each individual portion. Although this may not be the most important finding in relation to health impact it does have an impact on whether other businesses would be willing to use the takeaway toolkit recommendations in a similar way. As discussed above many fast food retailers are family run sole trading businesses on very tight profit margins. This makes the pressure to produce profit on each item

sold very intense. This finding chimed with the findings of the Liverpool study which found fast food retailers who were able to identify new products with high profit margins (jacket potatoes) where very willing to make the change to healthier food provision. It also chimes with other findings in this study which showed the most important elements for the retailer were revenue vs cost of products on sale, only matched by the importance attributed to the customer's experience.

Changes at the community level

Competition

The importance of competition within the fast food community was raised by the retailer during the interview. There is very little variety in the style of foods served by different businesses of the same type. These types of businesses therefore appear to compete solely on two things: price and quality. The only differences between businesses which were recognised by the manager in the study fast food retailer were taste, texture, portion size and cost. These same differences between fast food retailers have been found to some extent in the existing literature (15, 74, 103). It is possible there are other factors which influence customer choice to use premises; for example customer service, wait times for ordered food, delivery service availability, parking/convenience of access. These aspects have been investigated in other marketing studies, their specific influence over healthy choices is an emerging area of research, and few good quality papers have been published. However there was some interesting work by Pitt into customer loyalty which will be referred to later (104).

Competition was deemed important by the retailer; a new or innovative product would need to build a customer base and few fast food retailers would be willing to spend more on this product without proof of profitability (105).

Changes at the systemic level

Regional availability and cost of producing healthier foods /traditional fast food menu

Due to the homogeneity of food provision within fast food retailers in general it is difficult for a single food retailer to make a dramatic change to their menu, this is supported in Hollingsworth's paper on food retail competition which identifies the concentration of purchasing power within the larger manufacturers and away from sole traders like the retailer in this thesis (106). However, this artefact about the fast food retail sector does present an opportunity; as many retailers purchase their food from the same few national or regional distributors; where Hollingsworth identifies the power to make changes lies, there is a policy lever available here which could affect the whole sector. Unfortunately Esbjerg identifies a lack of interest in innovating within the food retail industry unless the technology is extremely low risk. His work based on interviews with retailers in the UK, Denmark and Belgium identified a specific lack of interest in testing new technology or processes amongst food retailers (107). Through making a change to the food distributed within the sector there is an opportunity to effect a system wide change. This is supported by much of the research funded or published by the Food Standards Agency which recommends reformulation and portion resizing as the

most effective means of changing the diet of the general public with regards to processed foods (108) (109).

Recommendations for further study

Competition

Within the study area the nearest other fast food retailer of a similar cuisine was a 200meter walk away (as the crow flies), which included crossing a main road and a railway line, for an adult it could be argued this is not a major discouragement however research has shown children are unlikely to travel further than 400m to purchase fast food unless public transport is available to make the journey easier (57, 75, 101). This extra journey was therefore likely to have been a disincentive for children to seek an alternative fast food retailer. Within the study area there are thirteen fast food retailers, there was therefore a substantial range of food available, if pupils were unhappy with the reduction in portion size they had only to choose a different food item from a different retailer. Competition between fast food retailers was investigated by Caraher who found when fast food retailers are clustered close together the pressure to provide the cheapest and biggest portions is a driver of their behaviour (57). The results of this thesis's study cannot be compared to the Caraher study as there was very little competition for 'cheesy chips' in the area. It would therefore be interesting to investigate the implementation of the takeaway toolkit within an area where competition was fierce i.e.in an area with several fish and chip shops close together, would the portion

size intervention (which was successful in the thesis study) have been so successful in this environment? What would cause customers to change their consumer patterns?

Customer Perspective

It would also be interesting to investigate the customer perspective; what draws them into the study retailer currently. Although there is a large provision of fast food in the study area there were few fast food retailers serving the same food items. Of the thirteen fast food retailers in the study area only two serve cheesy chips in a child's portion. It is therefore an area where competition between retailers is low. The study did not gather data which would allow for an analysis of how likely children would be to walk the extra 200meters to the other retailer for a cheaper or larger portion of food. The study survey indicated that none of the children had eaten from the other chip shop in the previous month. Some interesting research looking at children walking to purchase fast food has been done, with the majority finding that children will frequent fast food retailers who are on their route home more frequently and identifying a five minute walking distance as a determining factor of purchasing behaviour (20, 131, 132).

Customer taste preference

A customer survey carried out independently of this thesis by the manager of the fast food retailer identified beef fat as a preference over other fats.

There have been many marketing research studies in to taste and customer preference, a database search of JSTOR on the topic gives over 3000 journal

articles. During the interview the food retailer spoke about his belief (as a result of the customer survey he had carried out) that there was a customer preference for beef fat due to customer expected taste differences. It would be interesting to investigate further whether consumers can tell the difference between chips cooked in vegetable fat and those cooked in beef fat; Saguy and Dana did some work on this in 2003 identifying the health implications of customer's sensory experience of deep fried food (133). It is possible food engineers, who can identify a cooking vehicle which produces the same texture, taste and customer experience as deep fried beef fat would be a useful adjunct to this discussion. There has been some work done on air fryers, a technology which imitates deep fat frying with much lower use of oils or fats (134). However the technology is prohibitively expensive currently and the research shows there is a substantial difference in texture between each technology which is yet to be found acceptable by customers (134). It is therefore recommended that an extension of this study could be to investigate customer taste preferences with a blind tasting methodology.

Portion Size

The study finding on portion size was interesting because although there were thirteen fast food retailers within the study area there were no other retailers in the study area (frequented by pupils) who served deep fried chips with cheese. This could have meant the change to the portion size, although noticeable by customers, did not impact on sales because there is no other option for purchasing chips in the study area. In a future study it would be useful to test out the impact of

direct competition on the changes made, if a portion size is reduced in one retailer but not another would customers change their purchasing habits.

Healthy food provision in fast food takeaways

A further extension of this study would be to explore the customer's perceptions and experience around healthier food provision in fast food retailers. Customers are a vital part of the fast food system, as identified in this thesis's study the main driver on the fast food retailer was customer opinions and experience and this was supported by the Newcastle study as discussed above (74). It would therefore be interesting to understand whether customers care about the healthiness of the food they are purchasing. Do customers go to a fast food restaurant looking for healthy food? If healthy food is available will they purchase it? Some work has been done in this area in Australia by Wellard and by Tyrrell in the UK. Tyrrell carried out an observational study with teenagers to ascertain where they obtain their food over a four day period and what the average nutritional value of that food was. They found that food purchased in fast food takeaways tended to be more energy dense than that obtained in the home environment(135). Wellard who carried out an observational study in a MacDonalds. Of 1,449 meals purchased in the premises by adults or children during their observation only 1% could be classified as healthy, despite the healthy options being fully available. This indicates that providing healthy options and relying on consumer choices may not be an effective mechanism for reducing consumption of unhealthy foods (136). On a similar theme a small study in Liverpool identified a potential market for healthier fast food in the restaurants they worked with; if a family was purchasing their evening meal from a

takeaway they identified there was often one or more members of the family who did not want to eat 'unhealthy' food and therefore the provision of a healthy option (in most cases a pre-cooked jacket potato) allowed the whole family's meals to be purchased from one takeaway which increased profit (45).

Within the grey literature found during the literature review there are indications of several small research studies into food retail interventions in the UK.

There has been little research into customer perspective on this area, however a number of studies have been carried out to identify the impact of point of sale interventions to influence purchasing. An international systematic review in 2016 by Adam and Jensen identified a total of 42 papers (in English) relating to interventions in food shops intended to increase healthiness of food purchased (137), and found some evidence these could be successful. Few papers were found which investigated customer perspectives on this. It is not possible to draw conclusions about customer preference without further research which identifies their experience; an extension to this study which would be useful therefore is to include data from the customer within the analysis of impact of an intervention in the food environment. A suggestion for this would be a randomised control trial where a group of fast food retailers were recruited with some receiving the takeaway toolkit intervention and some receiving a placebo intervention. In order to minimise bias it would probably be necessary to separate by city.

As identified in the thesis study an important factor when making changes to a retail business is the customer's experience and preference. It would be especially interesting to identify what makes customers purchase their food from a specific retailer, are they loyal to that retailer over time? Some research on this topic from Australia indicates the reasons for customer loyalty (104). A qualitative study in this area would provide a rich seam of information which has hitherto not been investigated fully.

What do we now understand as a result of this study?

The footfall survey in this study, although small, confirms findings from other research which shows fast food retailers in close proximity to schools are frequented by unaccompanied school pupils in large numbers in the post school period. This is an important finding because so few papers within the literature have carried out surveillance to identify children's food behaviour around and within fast food retailers, one exception being Bagwell's work in East London (34). This finding will contribute to the debate over whether primary school children are affected by fast food retailers around the school they attend, because it shows that there are primary school pupils who frequent fast food retailers unaccompanied on the route home from school. The footfall survey was carried out in the Autumn and in the Spring during both periods of observation there was heavy rainfall for one of the days observed which could have influenced the number of pupils who entered the retailer on their way home from school.

There has been little research carried out into barriers to food businesses providing healthier food. The results of this study indicate food businesses may not be

averse to changing their food practices to improve nutritional content of their food so long as it does not conflict with their desire to please their customer and make a suitable amount of profit. This is an important finding because in order to make changes to the food served in fast food retailers the people who own and work in those retailers have to be willing to change. The findings in this thesis indicate there are fast food retailers who would willingly participate in projects to improve the nutrition of their food offer. However this thesis also found there are some strong disincentives for the business when considering making changes, one of these is the cost of raw ingredients and the impact of these costs on profitability.

Food businesses such as the study retailer source their food from large regional suppliers, food supply chains tend to be long and take advantage of economies of scale (39). These economies of scale allow for low cost food to be produced at scale within the local food environment, and this is the fundamental reason these businesses all serve the same food items prepared in similar ways for a comparable cost. Therefore a potential way to widely influence nutritional content of fast food would be to change the formulation of foods higher up the food chain and this is supported by research carried out in the US by Bleich and Wolfson which identified the reduction of calories in meals reformulated by a large scale food distributor (138). In this study the food distributor had made efforts to reduce the calorie of the standardized meals served in restaurants they supplied, the researchers found that customers were not concerned about these changes and therefore potentially reduced their calorie intake unconsciously. Other work by

Cohen and Story identified the increase of vegetables and reduction of meat on a plate was still acceptable to customers (who still reported high satisfaction with the meal they were served), indicating that improving the healthiness of a meal can be positively received by customers (17). A possible point of influence for the public health community would therefore be to work with regional or national suppliers. This work has begun to be undertaken by PHE who have recently introduced a new healthy eating campaign called 400,600,600. This aims to encourage people to look for meals when they are purchasing food outside the home that contain less than 400 calories for breakfast, 600 calories for lunch and 600 calories for evening meal. Through this project they are pressuring the large food retailers to create meals which meet these guidelines. If the food available to local sole traders was improved nutritionally at source this would negate the influence of competition as a barrier to change which was identified in this thesis. This is supported by Lang in his report to the Obesity Review on the ecological perspective on obesity which has been discussed above. He recommends the public health community focus its energy on making this shift amongst food suppliers. In his opinion this is the only way to have a lasting and significant impact on the obesity epidemic (139). It is also identified within the takeaway toolkit itself. This viewpoint is supported by the findings of this thesis' study; the manager identified the homogeneity amongst fast food retailers caused by the reduced range of products available from national suppliers, he also identified the difficulties he would have in purchasing unusual foods from his food distributor. He was constrained by the ingredients available to

him and the ingredients available to him were limited by what the fast food retail community purchase most frequently.

The study retailer described how he has a slight advantage when applying the recommendations in the takeaway toolkit because he was able to take advantage of economies of scale because their parent company is a city level food supplier, they are able to source the best price for their ingredients, and able to spread the cost of any more expensive options amongst their other customers. The fast food retailer acknowledged he had some freedom to try new products (for example the low fat cheese) without taking on unacceptable risk because of this relationship with the parent company. Other fast food retailers would have difficulty taking these risks. The fast food retailer also recognised the influence of competition on what he offered on his menu due to the need to match what is on offer within other fast food retailers. Some of this is influenced by customer expectation and as was found in the thesis study meeting customer's preferences and ensuring their experience is good are extremely important factors when deciding what and how to serve foods.

Strengths of the study

Variety of data collected

Gathering data from each element of the fast food retailer allowed for a good understanding of the impact of the takeaway toolkit intervention on the retailer.

Length of time over which data collected

A further strength of the study was the length of time over which the data was collected. The final data was collected in May 2018 which resulted in a robust study as the changes which were witnessed within the premises were certainly long-term changes which had been in place for several months at the time of second data collection period.

Recruitment of a FFR was successful

The study was also successful in recruiting the specific fast food retailer who was frequented most often by the pupils to receive the intervention. It would have been possible to carry out the intervention with another food premises in the study area, as there was enthusiasm registered during the recruitment phase of the study. The in depth data recording on the study fast food retailer gave the opportunity to gather a full picture of the study premises, which contributed towards more reliable conclusions.

Limitations of the study

All research is prone to limitations and there were some inherent limitations to the methods chosen.

Small size of study

Although this study only worked with one school and one fast food retailer the size of this study was appropriate for a masters by research level study. Despite the

size this study was able to identify the barriers to changing food in a fast food retailer and indicate there may be potential population level changes to nutritional content which could be achieved if the recommendations within the Takeaway Toolkit are fully implemented within fast food retailers in the UK.

Survey

The use of surveys was discussed in detail during the methods chapter; they provide a good method for collecting a lot of quantitative data from a large group of people quickly. There are also some acknowledged drawbacks to the use of surveys to gather study data (77).

This survey was administered to a school class $n=24$; there were no children who chose not to complete the questionnaire, however we know from the results that the demographics of the study survey differed from the city's demography indicating they were from a lower socio economic group than the average within the city.

Fieldwork

The intervention with the retailer was completed fully however during the qualitative interview it became obvious the fast food retailer would have been happy to have overt surveillance in his premises. In a future study it would be useful to gather this data to contribute to a more in depth understanding of the customer's behaviour within the food premises.

Conclusions

The reduction in portion size was the most significant action taken by the fast food retailer in the study. This had the potential to influence the consumption of high fat, salt and sugar foods by the retailer's customers. Other changes had been made to the food served but these had minimal impact. The study identified the recommendations within the takeaway toolkit can be successful in improving the healthiness of foods served within a fast food retailer.

In conclusion the study showed it is possible for a fast food retailer to make nutritional changes to their food for sale, and these changes did not undermine the economic viability of the business. The fast food retailer recruited was enthusiastic to make changes, especially when they resulted in increased profits. Changes were made willingly providing they did not result in a loss of profit; through either increased raw material cost or lower sales numbers. Once a change had been made to the food offer the only thing which would cause it to be reverted were customer complaints.

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Chapter 6 Appendices

Appendix 1 School Questionnaire

Appendix One

Primary School Research Questionnaire

Please write the number you were handed in this box

Q1 The purpose of this questionnaire is to gain information about your eating and playing habits. The information will help to describe the food environment around your school and may be used for planning in the future. These questionnaires are confidential and will not be read by anyone connected with your school. All the completed questionnaires will be sent to the University for analysis and then the questionnaires will be stored confidentially for 10 years before being destroyed. The questionnaire is not a test and you can ask for help whenever you need it. Also, if there are any questions you do not want to answer just leave them out. 1) Please answer all questions honestly 2) DO NOT write your name on any page

Q2 I agree to take part in this survey?

- ☐ Yes
- ☐ No

Q3 Are you a boy or a girl?

- ☐ Boy
- ☐ Girl

Q4 How old are you?

Q5 What is your postcode?

Q6 Which of the following best describes your ethnic background?

- ☐ White British
- ☐ White Irish
- ☐ White Romany or Gypsy
- ☐ White traveller of Irish heritage
- ☐ Any other White background
- ☐ Bangladeshi Asian
- ☐ British Asian
- ☐ Indian Asian
- ☐ Pakistani Asian
- ☐ Any other Asian background
- ☐ Black African
- ☐ Black British
- ☐ Black Caribbean
- ☐ Any other Black background
- ☐ British Chinese
- ☐ Chinese
- ☐ Any other Chinese background
- ☐ Mixed White & Asian
- ☐ Mixed White & Black African
- ☐ Mixed White & Black Caribbean
- ☐ Any other mixed background
- ☐ Any other background
- ☐ Don't want to say

Q7 Which adults do you live with?

- ☐ Mum & Dad together
- ☐ Mainly or only Mum
- ☐ Mainly or only Dad
- ☐ Mum & Dad shared
- ☐ Mum & Stepdad/partner
- ☐ Dad & Stepmum
- ☐ Mum & Mum or Dad & Dad
- ☐ Other relatives e.g. aunt or grandad
- ☐ Foster parents
- ☐ Resident Social Worker
- ☐ Other (please tick and describe in box)

Q8 How many portions of fruit and vegetables did you eat yesterday? Please tick ONE answer. If more than 8, tick 8. A portion is about one handful. To help you

decide, all of these count as ONE portion: ONE portion = 80g = any of these...1 apple, banana, pear, orange or other similar sized fruit3 heaped tablespoons of vegetables (raw, cooked, frozen or tinned)1 cupful of grapes, cherries or berries a glass (150ml) of fruit juice (however much you drink, it counts as one portion)a dessert bowl of salad N.B. Potatoes don't count when thinking about 5-a-day

- ☐ None
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8

Q9 What did you do for lunch yesterday? Please tick ONE answer.

- ☐ School food
- ☐ Ate a packed lunch from home
- ☐ Bought lunch from a takeaway or shop
- ☐ Went home for lunch
- ☐ Did not have any lunch

Q10 Have you ever had free school meals, or vouchers for free meals? Please tick one answer

- ☐ No
- ☐ Yes, I have them now
- ☐ Not now, but I have had them
- ☐ No, but I could have had them
- ☐ Don't know
- ☐ Don't want to say

Q11 Did you eat or drink anything before lessons this morning? You may tick MORE than one answer

- ☐ No, nothing at all
- ☐ Yes, something at home
- ☐ Yes, something on the way to school
- ☐ Yes, something at school

Q12 What did you have before lessons this morning? You can tick more than one answer

- ☐ Nothing to eat or drink
- ☐ Energy drink (e.g. Red Bull, Relentless, Lucozade Energy etc.)
- ☐ Other drink
- ☐ Toast or bread
- ☐ Sugar-coated cereals
- ☐ Porridge/Readybrek
- ☐ Other cereals
- ☐ Yoghurt
- ☐ Breakfast bars
- ☐ Crisp-type snack
- ☐ Chocolate bar, sweets
- ☐ Biscuits/cake
- ☐ Fruit
- ☐ Cooked breakfast

Q13 How often do you eat or drink any of the following? Please tick one answer on each line.

	Rarely or never	Once a week or less	2-3 days a week	On most days
Any fish/fish fingers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fresh fruit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Salads	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vegetables	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"Energy" drinks (e.g. Red Bull, Relentless)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"Diet" fizzy drinks (low calorie)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other fizzy drinks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Milk	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Water	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Crisps	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Sweets, chocolate, choc bars	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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Q14 How much water did you drink yesterday? Only count plain water, do not count tea, coffee, squash-type drinks or fizzy drinks. A class water bottle is usually about 330ml (1/3 litre), which is about 2 cupfuls. Please tick one answer

- ☐ Nothing
- ☐ 1 or 2 cups
- ☐ 3-5 cups
- ☐ About a litre (6 cups)
- ☐ About 2 litres (12 cups)
- ☐ More than 2 litres

Q15 Which of the following shops have you bought food from in the past month?
You can tick more than one answer

- ☐ KFC
- ☐ Drakes Plaice
- ☐ Lees Plaice 4 Chips
- ☐ Plymouth Food and Wine
- ☐ Ivor Dewdney Pasties
- ☐ Pizza Hut
- ☐ Dominos
- ☐ Square Cafe
- ☐ Warrens
- ☐ St Budeaux News
- ☐ Kenny Kuet
- ☐ China Valley
- ☐ China House
- ☐ Devon Pies and Pasties

Q16 How fit do you think you are? Please tick one answer.

- ☐ Very unfit
- ☐ Unfit
- ☐ Not sure
- ☐ Fit
- ☐ Very fit

Q17 How many times last week did you exercise enough to make you breathe harder and faster? Please tick one answer.

- ☐ Never
- ☐ Once
- ☐ Twice
- ☐ Three times
- ☐ Four times
- ☐ Five times or more

Q18 How much do you enjoy physical activities? Please tick one answer.

- ☐ Not at all
- ☐ A little
- ☐ Quite a lot
- ☐ A lot

Q19 How did you travel to school today? Was it by...You may tick more than one answer.

- ☐ Car/van
- ☐ School bus
- ☐ Other bus
- ☐ Taxi
- ☐ Bicycle
- ☐ Walking
- ☐ Other, please tick and describe

Appendix 2 Ethical Approval letter



Tuesday 22nd November 2016

CONFIDENTIAL

Claire Turbutt
10 The Mews,
24 The Square,

Dear Claire,

Application for Approval by Faculty Research Ethics Committee

Reference Number: (16/17)-644

Application Title: Investigating the impact of a nutritional intervention on a food environment near a school in Plymouth

I am pleased to inform you that the Committee has granted approval to you to conduct this research.

Please note that this approval is for three years, after which you will be required to seek extension of existing approval.

Please note that should any MAJOR changes to your research design occur which effect the ethics of procedures involved you must inform the Committee. Please contact Sarah Jones (email sarah.c.jones@plymouth.ac.uk).

Yours sincerely

Professor Michael Sheppard, PhD, FAcSS

Chair, Research Ethics Committee -

Faculty of Health & Human Sciences and

Peninsula Schools of Medicine & Dentistry

Faculty of Health & Human Sciences T +44 (0)1752 585339

Professor Michael Sheppard

University of Plymouth

F +44 (0)1752 585328

CQSW

BSc MA PhD FAcSS

Drake Circus

E sarah.c.jones@plymouth.ac.uk Chair, Faculty

Research Ethics

Plymouth PL4 8AA

W www.plymouth.ac.uk

Committee

Appendix 3 Footfall survey blank record form

Table 6.1 *Footfall survey blank record form*

DATE:						
TIME						
LOCATION:						
FFR OBSERVED:						
RECORDER:						

TIME						
	00 – 10	10-20	20-30	30-40	40-50	50-60
No of individuals						
Primary School (in uniform)						
Secondary School (in uniform)						
Under 5s (non-uniformed)						
Adults						
No of groups						
Family (1 adult + 1 child min)						
Primary School group						
Secondary School group						
Other (explain)						

Appendix 4 Aggregated data, tables and figures from 15 question survey with pupils

Food behaviour

Breakfast on the morning of the survey

The most popular breakfast item reported was cereal; the healthiest items on the list; porridge, yoghurt and fruit were mentioned seven times (see table 6.2 below).

Table 6.2 *Aggregated data from survey for response to breakfast question (n=24)*

What did you eat for before lessons today?	Frequency %
Ate cereal (other), porridge, yoghurt, toast, breakfast bar or fruit	19
Ate something else	8
Ate nothing	2
Total	27

Fruit and vegetable consumption

Pupils were requested to state how many portions of fruit and vegetables they ate on the previous day; this is shown in table 6.3 below. Pupils were given a definition of a portion to help them calculate this.

Table 6.3 *Aggregated data for response to 5-a-day question (n=24)*

How many portions of fruit and vegetables did you eat yesterday?	Count
Met 5 a day recommendations	5
Did not meet 5 s a day recommendations	19
Total	24

Lunch on the day before the survey

Pupils were asked what they ate for lunch on the day before the survey, this data is shown in table 6.4 below. Five of the pupils reported they had not eaten any lunch at school the day before. Six of the pupils had eaten lunch from a takeaway or shop, despite the school having a closed gate policy. This means these six pupils must have purchased their lunch on

the way in to school, had lunch delivered to them by a parent/carers or their answers were inaccurate. Only one pupil reported they had eaten the school food provided at lunch time.

Table 6.4 *Aggregated data for response to question about lunch (n=24)*

What did you do for lunch yesterday?	Frequency
Bought from shop/takeaway or ate nothing	11 (46%)
Ate packed lunch, school food or went home for lunch	13
Total	24

Water consumption

According to the school's website pupils are able to access water throughout the school day and are able to drink as much as they want. Pupils were asked to indicate how much water they had consumed on the previous day, this data is shown in table 6.5 below. A definition was given to help pupils calculate the answer.

Four of the pupils reported they had not drunk any water on the day before the survey; four had drunk a healthy amount of water, 16 did not drink enough water to meet healthy guidelines for children's water consumption which for this age group is approx. 1.5litres per day or 9 cups.

Table 6.5 *Aggregated data for response to question on water consumption (n=24)*

How much water did you drink yesterday?	Frequency
Met guidance of 1.5litres	4
Did not meet guidance of 1.5litres	20
Total	24

Consumption of Free Sugars

Pupils were asked how often they consumed foods from a list. Their options were a) on most days, b) 2-3 times a week, c) less than once a week and d) rarely or never. The four answers were amalgamated into two categories a + b was categorised as 'regularly consume' and c + d was categorised as 'consume less than weekly'. The amalgamated results for foods which contain free sugars are shown below.

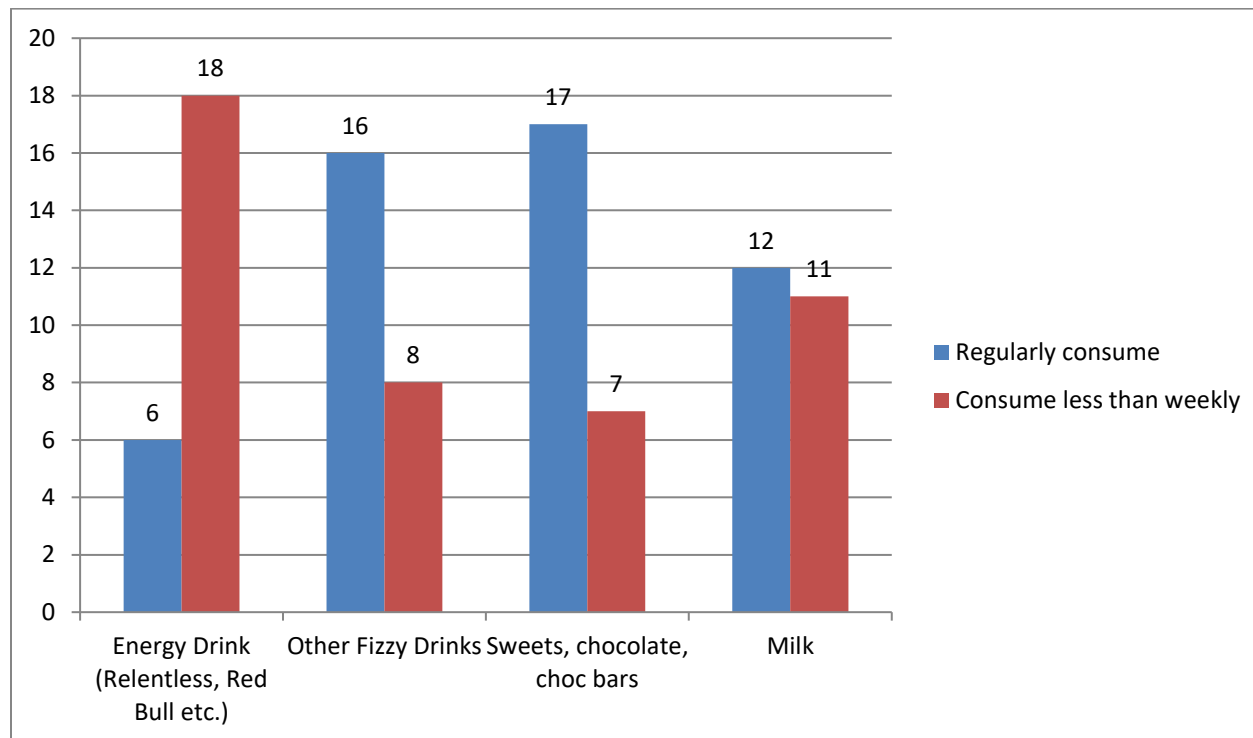


Figure 6.1 Column graph showing pupils self-reported consumption of foods containing free sugars ($n=24$).

Physical Activity behaviour

The 24 children who completed the survey were asked four questions relating to their level of physical activity which were repeated from the Health Related Behaviour Survey 2014-15. These were; how fit do you think you are, how many times

last week did you exercise enough to make you breathe harder and faster, how much do you enjoy physical activities, how did you travel to school today.

Four pupils reported they were unfit or very unfit, 11 pupils reported they were fit or very fit (Table 6.6).

Table 6.6 *Pupil's response to the question "How fit do you think you are?" (n=24)*

How fit do you think you are?	Frequency
Very Fit	5
Fit	6
Unsure	9
Unfit	3
Very Unfit	1
Total	24

Government guidance for children indicates they should do exercise which causes them to get out of breath for 30minutes seven times a week. Pupils were asked to report how many times they had done exercise which made them breathe harder and faster, this data is shown in table 6.7 below. Seven reported doing so on five or more occasions the other

whilst the other 17 reported doing so on less than five occasions. One pupil reported never exercising enough to make them breathe harder and faster

Table 6.7 *Pupil's response to the question "How many times last week did you exercise enough to make you breathe harder and faster?"*

How many times last week did you exercise enough to make you breathe harder and faster?	Frequency
Five times or more	7
Four times	1
Three times	5
Twice	6
Once	4
Never	1
Total	24

Pupils were asked to indicate how much they enjoy physical activity, see table 6.8 below. Fifteen pupils reported they enjoyed physical activities a lot or quite a lot. One pupil reported not liking physical activity at all.

Table 6.8 *Pupil's response to the question "How much do you enjoy physical activity?"*

How much do you enjoy physical activities?	Frequency
Not at all	1
A little	8
A lot	8
Quite a lot	7
Total	24

Pupils were asked to report how they travelled to school, this data is shown in table 6.9 below. 19 pupils reported walking or cycling at least part of the journey to school. 4 pupils reported being driven to school.

Table 6.9 *Pupil's response to the question "How did you travel to school today?"*

How did you travel to school today?	Frequency
Bicycle	1
Car/van	4
Car/van and walking	3
Other	1
Walking	15
Total	24

Appendix 5 Suppressed raw data

Table 6.10 *Suppressed raw data*

	I agree to take part in this survey?	Are you a boy or a girl?	How old are you?	What is your postcode?	Which of the following best describes your ethnic background?	Which adults do you live with?	Portions f&V	What did you do for lunch yesterday? Please tick ONE answer.	Have you ever had free school meals, or vouchers for free meals? Please tick one answer	Did you eat or drink anything before lessons this morning? You may tick MORE than one answer
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1	Yes	Boy	11	suppressed	White British	Mum & Dad together	4	Ate a packed lunch from home	No	Yes, something at home
2	Yes	Boy	11	suppressed	White British		2	Ate a packed lunch from home	Not now, but I have had them	No, nothing at all
3	Yes	Boy	11	suppressed	White British	Mum & Dad together	1	Ate a packed lunch from home		Yes, something at home

4	Yes	Boy	11	suppressed	White British	Mum & Dad together	3	Bought lunch from a takeaway or shop	No	Yes, something at home
5	Yes	Boy	11	suppressed	Mixed White & Black African	Mum & Dad shared	1	Bought lunch from a takeaway or shop	Yes, I have them now	No, nothing at all
6	Yes	Boy	11	suppressed	White British	Mum & Dad together	2	Did not have any lunch	No	No, nothing at all

7	Yes	Boy	11	suppressed	White British	Mum & Dad together	2	Went home for lunch	No	
8	Yes	Boy	11	suppressed	White British	Mum & Dad together	6	Went home for lunch	No	Yes, something at home
9	Yes	Girl	10	suppressed	White British	Mum & Dad shared	2	Ate a packed lunch from home		Yes, something at home
10	Yes	Girl	11	suppressed	White British	Mum & Dad together	2	Ate a packed lunch from home	Yes, I have them now	Yes, something at school

11	Yes	Girl	11	suppressed	White British	Mum & Dad together	None	Ate a packed lunch from home		Yes, something at school
12	Yes	Girl	10	suppressed	White British	Mainly or only Mum	2	Bought lunch from a takeaway or shop	Yes, I have them now	Yes, something on the way to school
13	Yes	Girl	11	suppressed	Don't want to say	Mum & Dad together	3	Bought lunch from a takeaway or shop	No	Yes, something at school

14	Yes	Girl	10	suppressed	White British	Mum & Dad together	3	Bought lunch from a takeaway or shop	Yes, I have them now	Yes, something at home
15	Yes	Girl	11	suppressed	White British	Mainly or only Mum	1	Bought lunch from a takeaway or shop	Yes, I have them now	Yes, something at home
16	Yes	Girl	11	suppressed	White British	Mum & Dad shared	6	Did not have any lunch	No	Yes, something at school

17	Yes	Girl	11	suppressed	White British	Mum & Dad shared	7	Did not have any lunch	No	No, nothing at all
18	Yes	Girl	10	suppressed	White British	Mum & Dad shared	2	Did not have any lunch	Yes, I have them now	Yes, something at school
19	Yes	Girl	11	suppressed	Any other White background	Mum & Dad together	8	Did not have any lunch	No	No, nothing at all
20	Yes	Girl	11	suppressed	Don't want to say	Mainly or only Mum	3	School food	Yes, I have them now	Yes, something at home

21	Yes	Girl	11	suppressed	White British	Mum & Dad together	1	Went home for lunch	No	Yes, something at home
22	Yes	Girl	11	suppressed	Don't want to say	Mum & Dad together	8	Went home for lunch	No	Yes, something at home
23	Yes	Girl	10	suppressed	White British	Mum & Dad together	2	Went home for lunch		Yes, something at home
24	Yes	Girl	10	suppressed	White British	Mum & Dad together	2	Went home for lunch	Not now, but I have had them	No, nothing at all

	What did you have before lessons this morning? You can tick more than one answer	How often do you eat or drink any of the following? Please tick one answer on each line. - Any fish/fish fingers	How often do you eat or drink any of the following? Please tick one answer on each line. - Fresh fruit	How often do you eat or drink any of the following? Please tick one answer on each line. - Salads	How often do you eat or drink any of the following? Please tick one answer on each line. - Vegetables
1	Other drink,Cooked breakfast	On most days	Rarely or never	2-3 days a week	2-3 days a week
2	Other drink	Rarely or never	On most days		2-3 days a week
3	Other drink,Porridge/Readybrek	Once a week or less	2-3 days a week	Rarely or never	Once a week or less

4	Energy drink (e.g. Red Bull, Relentless, Lucozade Energy etc.),Yoghurt		On most days	Once a week or less	Rarely or never
5	Energy drink (e.g. Red Bull, Relentless, Lucozade Energy etc.)	On most days		2-3 days a week	On most days
6	Other cereals	2-3 days a week		Once a week or less	2-3 days a week
7	Other drink,Other cereals	Rarely or never	2-3 days a week		2-3 days a week
8	Other drink,Toast or bread,Fruit	2-3 days a week	On most days	Rarely or never	On most days
9	Sugar-coated cereals	Rarely or never	2-3 days a week	Once a week or less	On most days
10	Other drink,Other cereals	Rarely or never	Once a week or less	Rarely or never	2-3 days a week

11	Other drink,Other cereals	Rarely or never	2-3 days a week	Rarely or never	Rarely or never
12	Yoghurt,Fruit	Rarely or never	On most days	2-3 days a week	On most days
13	Other drink,Sugar-coated cereals	Once a week or less	Rarely or never	Rarely or never	On most days
14	Other drink,Toast or bread	2-3 days a week	2-3 days a week	2-3 days a week	2-3 days a week
15	Other drink,Breakfast bars	2-3 days a week	Once a week or less	2-3 days a week	2-3 days a week
16	Porridge/Readybrek	Once a week or less	On most days	2-3 days a week	2-3 days a week
17	Other drink,Sugar-coated cereals,Porridge/Readybrek,Other cereals,Breakfast bars,Chocolate bar,	On most days	On most days	On most days	On most days

	sweets,Biscuits/cake,Cooked breakfast				
18	Nothing to eat or drink	Rarely or never	Rarely or never		Once a week or less
19	Nothing to eat or drink	Once a week or less	On most days	On most days	On most days
20	Other drink,Other cereals	Rarely or never	2-3 days a week	Once a week or less	On most days
21	Other drink,Toast or bread	Rarely or never	Rarely or never	Rarely or never	On most days
22	Other drink,Other cereals,Fruit	Rarely or never	On most days	On most days	Once a week or less
23	Other cereals	Rarely or never	Once a week or less	On most days	2-3 days a week

24	Other drink,Sugar-coated cereals,Other cereals	Once a week or less	Once a week or less	2-3 days a week	On most days
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	How often do you eat or drink any of the following? Please tick one answer on each line. - "Energy" drinks (e.g. Red Bull, Relentless)	How often do you eat or drink any of the following? Please tick one answer on each line. - "Diet" fizzy drinks (low calorie)	How often do you eat or drink any of the following? Please tick one answer on each line. - Other fizzy drinks	How often do you eat or drink any of the following? Please tick one answer on each line. - Milk	How often do you eat or drink any of the following? Please tick one answer on each line. - Water
1	Once a week or less	On most days	On most days	Once a week or less	On most days

2	Once a week or less	On most days	On most days	Once a week or less	On most days
3	Rarely or never	Rarely or never	Rarely or never	On most days	On most days
4	Rarely or never	Rarely or never	Once a week or less		Rarely or never
5	On most days	Rarely or never	Once a week or less	Rarely or never	Once a week or less
6	On most days	Rarely or never	On most days	2-3 days a week	On most days
7	On most days	2-3 days a week	On most days	On most days	On most days
8	Rarely or never	2-3 days a week	2-3 days a week	Once a week or less	On most days
9	Rarely or never	Once a week or less	Rarely or never	On most days	On most days
10	Rarely or never	2-3 days a week	2-3 days a week	Once a week or less	Once a week or less
11	Once a week or less	Once a week or less	Once a week or less	Rarely or never	Once a week or less
12	Rarely or never	2-3 days a week	Rarely or never	Once a week or less	On most days
13	Rarely or never	Once a week or less	2-3 days a week	On most days	Once a week or less
14	2-3 days a week	2-3 days a week	2-3 days a week	2-3 days a week	2-3 days a week

15	On most days	Once a week or less	On most days	On most days	Once a week or less
16	Once a week or less	Once a week or less	Rarely or never	Once a week or less	On most days
17	On most days	On most days	On most days	On most days	On most days
18	Rarely or never	Rarely or never	On most days	Once a week or less	2-3 days a week
19	Once a week or less	Rarely or never	On most days	2-3 days a week	On most days
20	Once a week or less	2-3 days a week	2-3 days a week	Once a week or less	On most days
21	Once a week or less	Once a week or less	2-3 days a week	Rarely or never	On most days
22	Rarely or never	Rarely or never	2-3 days a week	2-3 days a week	On most days
23	Rarely or never	Once a week or less	Once a week or less	On most days	2-3 days a week
24	Rarely or never	On most days	2-3 days a week	On most days	Rarely or never

	How often do you eat or drink any of the following? Please tick one answer on each line. - Crisps	How often do you eat or drink any of the following? Please tick one answer on each line. - Sweets, chocolate, choc bars	How much water did you drink yesterday? Only count plain water, do not count tea, coffee, squash-type drinks or fizzy drinks. A class water bottle is usually about 330ml (1/3 litre), which is about 2 cupfuls. Please tick one answer	Which of the following shops have you bought food from in the past month? You can tick more than one answer	How fit do you think you are? Please tick one answer.
1	On most days	On most days	About 2 litres (12 cups)	Suppressed	Unfit

2	2-3 days a week	Once a week or less	1 or 2 cups	Suppressed	Very fit
3	Once a week or less	2-3 days a week	3-5 cups	Suppressed	Fit
4	Rarely or never	Rarely or never	Nothing	Suppressed	Unfit
5	Rarely or never	Rarely or never	1 or 2 cups	Suppressed	Very fit
6		2-3 days a week	1 or 2 cups	Suppressed	Fit
7	Rarely or never	Rarely or never	About a litre (6 cups)	Suppressed	Not sure
8	2-3 days a week	2-3 days a week	About 2 litres (12 cups)	Suppressed	Very fit
9	Rarely or never	2-3 days a week	3-5 cups	Suppressed	Fit
10	Once a week or less	On most days	1 or 2 cups	Suppressed	Not sure
11	Rarely or never	Once a week or less	Nothing	Suppressed	Not sure
12	Rarely or never	Once a week or less	More than 2 litres	Suppressed	Very fit

13	Once a week or less	2-3 days a week	3-5 cups	Suppressed	Not sure
14	2-3 days a week	2-3 days a week	Nothing	Suppressed	Unfit
15	On most days	On most days	Nothing	Suppressed	Very unfit
16	2-3 days a week	Rarely or never	About 2 litres (12 cups)	Suppressed	Fit
17	On most days	On most days	About a litre (6 cups)	Suppressed	Not sure
18	On most days	On most days	1 or 2 cups	Suppressed	Not sure
19	2-3 days a week	On most days	1 or 2 cups	Suppressed	Fit
20	2-3 days a week	2-3 days a week	1 or 2 cups	Suppressed	Fit
21	On most days	2-3 days a week	1 or 2 cups	Suppressed	Not sure
22	Once a week or less	2-3 days a week	3-5 cups	Suppressed	Very fit
23	On most days	On most days	3-5 cups	Suppressed	Not sure
24	2-3 days a week	2-3 days a week	3-5 cups	Suppressed	Not sure

	How many times last week did you exercise enough to make you breathe harder and faster? Please tick one answer.	How much do you enjoy physical activities? Please tick one answer.	How did you travel to school today? Was it by...You may tick more than one answer.
1	Three times	A lot	Other, please tick and describe
2	Four times	A lot	Car/van, Walking
3	Twice	A little	Walking
4	Five times or more	A lot	Bicycle
5	Twice	A little	Walking

6	Five times or more	A little	Walking
7	Never	Not at all	Walking
8	Five times or more	A lot	Walking
9	Once	Quite a lot	Car/van
10	Twice	A little	Car/van
11	Once	A little	Walking
12	Three times	A lot	Walking
13	Five times or more	A lot	Car/van, Walking
14	Twice	A lot	Car/van
15	Twice	A little	Walking
16	Five times or more	A lot	Walking
17	Three times	Quite a lot	Walking
18	Once	A little	Walking
19	Five times or more	Quite a lot	Walking
20	Three times	Quite a lot	Walking

21	Once	Quite a lot	Walking
22	Three times	A little	Car/van
23	Twice	Quite a lot	Walking
24	Five times or more	Quite a lot	Car/van, Walking

